PORTLAND HARBOR RI/FS

ROUND 2 FIELD SAMPLING PLAN SEDIMENT SAMPLING AND BENTHIC TOXICITY TESTING

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AOC	Administrative Order on Consent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COPC	chemicals of potential concern
COI	chemicals of interest
CRD	Columbia River Datum
CSM	conceptual site model
DGPS	differential global positioning system
EPA	U.S. Environmental Protection Agency
EQuIS	Environmental Quality Information System
ERA	ecological risk assessment
F	Fahrenheit
FID	flame ionization detector
FSP	field sampling plan
HHRA	human health risk assessment
HSP	health and safety plan
ISA	initial study area
LWG	Lower Willamette Group
LWR	lower Willamette River
MSS	Marine Sampling Systems
NAD	North American Datum
PCBs	polychlorinated biphenyls
PID	photoionization detector
PSEP	Puget Sound Estuary Program
QA	quality assurance
QC	quality control
QAPP	quality assurance project plan
RI/FS	remedial investigation/feasibility study
RM	river mile
SEA	Striplin Environmental Associates
SMA	sediment management area
SPI	sediment-profile imaging
STA®	Sediment Trend Analysis®
TBT	tributyltin
TOC	total organic carbon
TPH	total petroleum hydrocarbon
VOCs	volatile organic compounds

1.0 INTRODUCTION

This sediment field sampling plan (FSP) presents the approach and procedures to implement Round 2 sediment sampling activities for the remedial investigation/feasibility study (RI/FS) of the Portland Harbor Superfund Site (Site). This FSP in conjunction with the Round 2 Quality Assurance Project Plan (QAPP; Integral and Windward 2004) describes the field sampling and laboratory analysis procedures to accomplish the following types of data collection:

- Surface sediment chemistry to support the human health risk assessment (HHRA), the ecological risk assessment (ERA) and FS, and to characterize the nature and extent of contamination, including contaminant distribution and potential source effects to the river
- Sediment bioassays to support the assessment of benthic risks for the ERA
- Subsurface sediment chemistry to characterize the nature and extent of contamination, including contaminant distribution and potential source effects to the river, and to support the FS.

Field sampling procedures for surface water, beach sediment, groundwater chemistry, and natural attenuation studies are being submitted to the U.S. Environmental Protection Agency (EPA) as separate task-specific FSPs. In addition, a Round 2 QAPP detailing all laboratory procedures to be used in Round 2 for chemical and biological analyses is being provided to EPA under separate cover. Background information and the overall objectives and approach for the RI/FS are provided in the Portland Harbor RI/FS Programmatic Work Plan (Integral et al. 2004).

This Round 2 sediment FSP was developed after considering comments by EPA (2003a,b) on previous versions of the draft Round 2A FSP (SEA et al. 2003; SEA and Windward 2003), which were submitted to EPA on April 17, 2003 and December 22, 2003. This document incorporates EPA comments on the draft Round 2A and Round 2 FSPs, which were received by the Lower Willamette Group (LWG) on November 6, 2003, February 20, 2004, and April 23, 2004.

In preparation for the Round 1 sampling program, a health and safety plan (HSP; SEA 2002) was submitted to EPA on June 14, 2002. This HSP was revised for Round 2 activities to ensure the health and safety of field and laboratory personnel and submitted to EPA on June 22, 2004.

The field study approach, project organization, field program and methods, analyses, and field-based data management for Round 2 sediment and benthic toxicity testing are described in this document. The sediment and bioassay sampling program and its rationale was defined by EPA and its partners, and is provided in Appendix A. Although Round 2 will focus on the initial study area (ISA), additional sampling will occur both upstream and downstream of the ISA. The ISA concept, which was implemented by EPA in the Statement of Work (EPA 2001a), focuses the initial investigation and characterization efforts on the in-water portion of the 5.7-mile stretch of the lower Willamette River (LWR) from the southern tip of Sauvie Island at river mile (RM) 3.5 to the southern end of Swan Island at RM 9.2, and adjacent areas logically associated with evaluation of the in-water portion of this stretch of the river (Figure 1-1).

1.1 OVERVIEW OF RI/FS SAMPLING PROGRAMS

This section provides an overview of the RI/FS sampling programs to enable the reader to understand how the Round 2 sediment sampling program relates to the entire RI/FS process. Additional detail is found in the RI/FS Programmatic Work Plan (Work Plan) (Integral et al. 2004). Four sampling rounds are planned:

- Pre-Administrative Order on Consent (AOC) tasks
- Round 1
- Round 2
- Round 3.

The first two sampling rounds have been completed; Round 3 is forthcoming. This FSP describes the approaches and procedures to implement Round 2 sediment sampling. The following sections describe the tasks completed during the first two sampling rounds and the scope for the tasks in Rounds 2 and 3.

1.1.1 Pre-AOC Tasks

Prior to execution of the AOC, a stipulated agreement was signed by the LWG (EPA 2001b) to conduct some significant and time-critical data collection tasks. It was agreed that this information would be necessary for the RI and could be collected prior to Work Plan development. The four tasks listed below were completed under the stipulated agreement:

1. Sediment-profile imaging (SPI)
2. Multibeam bathymetry – high water
3. Juvenile salmonid residence time
4. Integrated evaluation of historical navigation channel bathymetry and a Sediment Trend Analysis (STA®).

Of these four tasks, the first three involved fieldwork undertaken by the LWG. The fourth task consisted of analyzing two pre-existing data sets. Other field efforts not included in the stipulated agreement, which were conducted by the LWG in the spring of 2002, involved the collection of water current profiles at several transects across Portland Harbor (see Work Plan, Section 2.2.2).

These tasks provided essential information that was useful for developing and refining the physical and biological preliminary conceptual site model (CSM), as presented in the Work Plan, and will be used to update the CSM in the future.

1.1.2 Round 1 Work

A draft Round 1 FSP (SEA et al. 2002a) was previously submitted to EPA on June 14, 2002. Elements of the proposed Round 1 field sampling program were approved by EPA and implemented in 2002. Round 1 sampling was conducted in the summer and fall of 2002 prior to the final approval of the Work Plan. Sampling included data collection to fill apparent data gaps and exploratory data collection and surveys to more completely identify future data needs. In addition, the data collection efforts were seasonally dependent tasks, and in order to meet the expedited schedule for completion of the RI/FS, the LWG chose to proceed rather than wait to initiate the tasks until the following year. The LWG prepared a Round 1A FSP (SEA et al. 2002b) for these initial tasks. Round 1A sampling work, approved by EPA in May 2002, included the following activities:

1. Collection of fish and shellfish tissue for chemical analysis
2. Evaluation of epibenthic colonization using multiplates
3. Reconnaissance survey of plants and amphibians
4. Reconnaissance survey of adult lamprey
5. Measurement of riverbank erosion and accretion using sediment stakes
6. Multibeam bathymetry – low water.

A pilot mark/recapture study of juvenile salmonids was also authorized as an additional Round 1A task, but was not completed because high water temperatures at the initiation of the study would have caused unacceptable stress on the fish. Additional sample collection tasks for 2002 were proposed in the draft Round 1 FSP submitted to EPA in June 2002 (SEA et al. 2002a). EPA approved a subset of these tasks in September 2002:

1. Beach sediment chemistry
2. Reconnaissance-level benthic infauna community analysis
3. Co-located sediment chemistry at sculpin, crayfish, and benthic infauna stations.

Field activities related to the above tasks occurred in the fall of 2002. In September 2002, the LWG also undertook a reconnaissance survey of juvenile lamprey and benthic infauna for potential tissue analysis.

The data collected in Round 1 meet various RI/FS data needs including:

- **Fish and Shellfish Tissue and Sediment Chemistry.** These data provide critical information for both ecological and human health risk pathways for which there was little or no pre-existing information. These data allow direct measurement of site-specific concentrations in aquatic organisms to which aquatic organisms, wildlife, and humans may be exposed.
- **Multiplates, Reconnaissance Surveys, and Benthic Infauna.** This effort provides information to identify ecological and human health exposure pathways and receptors likely to be present at the Site. This information assists in the development of the CSM and determination of significant pathways and receptors included in the risk assessments.
- **Sediment Stakes and Bathymetry.** This effort provides time-series data on riverbed changes. These data assist the development of the physical CSM and selection of sampling locations and methods related to issues such as sediment and chemical stability, sedimentation/scour areas, and surface layer depth determination. These data also supplement the STA®, SPI, bathymetric, and other physical system data described in Section 2 of the Work Plan.

In addition to field data collection, two existing information reviews are being conducted:

- Evaluation of existing upland site information for potential sources and source-related data
- Evaluation of the impact to sediments and ecological receptors from groundwater chemicals discharging from upland areas to the river.

This information will be used to help categorize potential chemical of interest (COI) sources of risk based on their potential to adversely affect sediments or river water. In addition, this process will help identify areas of the river where reviews of historical information indicate the probability of COI sources, but existing information is insufficient to confirm the absence or presence of a source.

1.1.3 Round 2 Work

Round 2 sampling is intended to gather the majority of the remaining data for the RI and risk assessments as well as initiate some FS data collection. Additional FS data collection and sampling to address data gaps identified in Round 2 will occur in Round 3. It is anticipated that Round 2 will require multiple field efforts that will likely take place throughout 2004 and early 2005. This is necessary so that EPA and the LWG have sufficient time to review and agree upon appropriate sampling methods and locations for each type of sampling, and because information needed to develop Round 2 FSP and QAPP addenda (e.g., hydrodynamic model results, CSM update, groundwater evaluation process) will become available throughout 2004. There may be reasons to have components of either of these phases divided further or combined in some other way. Consequently, flexibility in the phased approach, as described below, will be maintained as the project develops so that the approach can be adapted, as necessary, to better meet the objectives of the Round 2 sampling program. For each subsequent sampling effort, the procedures not covered in previous submittals will be described in task-specific FSPs or FSP addenda and approved by EPA prior to initiating that sampling work.

This FSP covers the first phase of the Round 2 sampling program. The following data types will be collected during this phase:

- Surface sediment chemistry to support the ERA and to characterize the nature and extent of contamination, including contaminant distribution and potential source effects to the river
- Sediment bioassays to support the assessment of benthic risks for the ERA
- Subsurface sediment chemistry and physical data to characterize the nature and extent of contamination, including contaminant distribution and potential source effects to the river, and to support the FS.

Other Round 2 work to be included in future sampling phases includes:

- Additional subsurface sediment chemistry and physical data to support site characterization and site-specific FS needs
- Surface water chemistry to evaluate potential effects of sources on the river system and to support the HHRA and ERA
- Beach sediment chemistry to support the ERA and HHRA beach exposure scenarios
- Collection of groundwater, transition zone water, seep water, surface water, and/or sediment data to evaluate the impact to

sediments and risk to human health and the environment from groundwater chemicals discharging from upland areas to the river

- Preliminary natural attenuation sampling (e.g., radioisotope cores) targeted for areas found to have potential processes that may support this alternative.

These data collection efforts are expected to provide the information needed to answer questions about the physical system, the identification of source effects to the river, and the nature and extent of chemical constituents that may pose unacceptable risks to ecological receptors and human health.

At the completion of Round 2, interim risk evaluations and a comprehensive data gaps analysis will be performed to assess potential additional data needs. Along with previous rounds of sampling data, the Round 2 information also will be input directly into the baseline risk assessments.

1.1.4 Round 3 Work

The primary purpose of Round 3 work is to gather data for the evaluation of FS alternatives. Activities may include further collection of sediment or related data to better define sediment management areas (SMAs) that are identified following the baseline risk assessments (and any related principal threat areas). [Note that the SMA concept is defined and discussed in Section 8.6 of the Work Plan (Integral et al. 2004)]. In many cases, refinement of SMAs also may be conducted as part of the remedial design/remedial action phase after the Record of Decision. In addition, if there are substantial data gaps identified in the interim risk evaluations, these gaps may also be filled, in some cases, during Round 3. Round 3 is planned as one sampling event that will take place in 2006. However, as with Round 2, the approach may be adapted to one or more sampling efforts, each with an approved FSP, as project developments warrant.

The following data will be collected during Round 3:

- Surface and subsurface sediment chemistry to refine SMAs and volumes, if needed, to complete the FS
- Surface and subsurface physical characteristics relevant to potential remedial alternatives (e.g., consolidation potential, sheer stress, Atterberg limits, grain size, water content, specific gravity)
- Additional natural attenuation sampling (e.g., radioisotope cores, sediment traps, water sampling) targeted for areas found in Round 2 to have potential processes that may support this alternative
- Sampling at potential disposal sites, as necessary, to support evaluation of remedial alternatives

- Data to fill interim risk evaluation data gaps or uncertainties
- Data to fill nature and extent, or source effect uncertainties
- Data needed to conduct additional risk assessment activities to evaluate, compare, and support conceptual design of potential remedial alternatives.

These data will be used to develop the RI, baseline risk assessments, and FS. The RI and baseline risk assessment documents will include refinements of the same evaluation conducted at the end of Round 2. The FS will use the refined SMAs to develop a list of potential remedial alternatives that could be applicable to each area.

1.2 OBJECTIVES OF ROUND 2 SAMPLING

As noted above, the Round 2 sampling efforts are intended to fill data gaps related to site characterization, ecological and human health risks, and the FS. Round 2 sampling efforts will include surface sediment chemistry, subsurface sediment chemistry, subsurface sediment physical data, water column chemistry, and surface sediment bioassays. Groundwater, transition zone water, seep, surface water, or sediment sampling may also be performed in Round 2 to evaluate the impact to sediments and risk to human health and the environment from groundwater chemicals discharging from upland areas to the river. Preliminary sampling to evaluate natural attenuation as a remedial alternative will also be conducted in Round 2. Most of the sampling activities will take place within the ISA; however, some additional sampling will occur both upstream and downstream of the ISA.

EPA proposed the sediment sampling and benthic toxicity testing programs provided in Appendix A. Except for minor modifications and phasing of the subsurface investigations, and minor station location adjustments resulting from the May 2004 site reconnaissance, the sediment chemistry and benthic toxicity sampling programs presented herein are the programs proposed by EPA. The LWG understands that these programs reflect consensus among EPA, EPA's partners, and the LWG for Round 2 sediment chemistry and benthic toxicity studies.

The overall RI objectives that the Round 2 sampling efforts support include:

- Identify and evaluate direct and indirect, known and unknown sources of contamination
- Identify and define local areas of in-water contamination
- Define the horizontal and vertical extent of contamination in all media

- Identify buried sources of contamination that pose a potential risk to human health or the environment
- Evaluate impacts on sediments, surface water, and biota due to contaminated groundwater discharges
- Update and refine the conceptual site model with respect to temporal, physical, and chemical stability
- Develop a predictive model and/or support a direct toxicity approach to assess risks to the benthic community
- Evaluate whether the ISA should be expanded to define the Site
- Assess what sources can be controlled by early actions
- Collect adequate data to fill data gaps identified as a result of the preliminary hydrodynamic model and to support the hydrodynamic model
- Collect data to understand contaminant fate and transport in the river system to adequately support remediation decisions.

1.3 DOCUMENT ORGANIZATION

The remaining sections of this document describe the sampling plan and field procedures that will be used during Round 2. Section 2 describes the sampling approach. Section 3 describes the project organization and key personnel roles, as well as the project schedule. Section 4 includes the detailed procedures that will be used in the field, including specific sampling methods for each medium. Section 5 summarizes the laboratory analysis program. Section 6 discusses the data management plan for the field sampling program. Section 7 summarizes how the data will be reported. Finally, references are provided in Section 8.

2.0 SAMPLING APPROACH

This section describes the sediment and bioassay sampling design and sampling locations that will support the objectives of the Round 2 RI/FS investigations, as appropriate. The design and rationale for the sediment and bioassay sampling program was provided by EPA and its partners (see Appendix A). Conditions encountered in the field may result in modifications to the sampling design; however, EPA will be contacted when modifications to the sampling design are necessary (see Section 3.3).

Target surface (sediment chemistry and bioassays) and subsurface (sediment chemistry) sample locations are shown in Figures 2-1 and 2-2, respectively.[1] Table 2-1 summarizes Round 2 sediment sample numbers, types, and analyses. Surface sediment sample locations and analyses are listed in Table 2-2. Subsurface sediment sample locations and analyses are found in Table 2-3.

The sampling plans for surface sediment and subsurface sediment are presented in the following subsections. As appropriate, the discussion is subdivided into sections on site characterization, ERA, HHRA, and FS. The approaches for these elements of the RI/FS are described in more detail in the Work Plan (Integral et al. 2004).

2.1 SURFACE SEDIMENT CHEMISTRY AND BIOASSAY TESTING

2.1.1 Data Needs

Additional surface sediment data are required to support the site characterization, ERA, and FS tasks.

Site Characterization

Data generated in Round 2 will be used with Round 1 data and appropriate historical Category 1 data to define the nature and extent of contamination within and immediately upstream and downstream of the ISA and to establish where unacceptable risks occur in Portland Harbor in the risk assessment process. Spatial distributions of chemicals of potential concern (COPC) that are identified through the risk assessment process will be evaluated to identify potential source areas.

Ecological Risk Assessment

Co-located surface sediment bioassay and chemistry data are useful to assess risk to benthic invertebrate communities. Therefore, a large proportion of the sediment

[1] Figures 2-1 and 2-2 and Tables 2-1 through 2-3 incorporate the consensus station adjustments made during a joint EPA and LWG site reconnaissance conducted on May 24-25, 2004 to verify nearshore station accessibility and placement (see Section 4.6.1).

characterization locations will also include sampling for bioassays. The data on COPC concentrations in surface sediments collected for site characterization purposes will also be considered, where appropriate, in assessing exposure to aquatic- and shore-feeding ecological receptors.

Assessment of risk to the benthic invertebrate assessment endpoint relies principally on surface sediment chemistry and whole sediment toxicity tests to identify areas that may result in unacceptable risks. The proposed methodology for assessing risk to benthic invertebrates is to develop a predictive site-specific relationship between sediment chemistry and toxicity using a discrete data set that can then be applied to the entire Portland Harbor Site. If a relationship is found, it will be applied to surface sediment chemistry data (existing and new) to map areas within Portland Harbor with the potential to pose unacceptable risk to benthic communities. Bioassay sample locations for Round 2 have been selected in cooperation with EPA to provide data for the predictive model and to characterize chemical distribution in areas not previously evaluated. The proposed sampling locations are shown in Figure 2-1. The sediment bioassay approach is being developed with EPA and its partners as a technical memorandum. The benthic assessment approach may not adequately account for toxicity associated with volatile organic compounds (VOCs) due to sample homogenization prior to bioassay testing. If VOCs are detected in the unhomogenized subsamples at some locations, then future testing at those locations may be required to address potential risks to the benthic community from VOCs.

The proposed sediment sampling plan will adequately characterize wildlife habitat areas except for shorebirds' use of beaches, which is addressed in a separate task-specific beach sediment FSP.

Feasibility Study

Initial data on engineering properties of sediments (i.e., specific gravity and Atterberg limits) will be generated to support the FS. Samples for specific gravity will be collected at all stations.

2.1.2 Sample Type

Surface sediment samples will be collected at nearly all stations from the 0- to 30-cm depth interval using a 0.3-m^2 hydraulic power-grab sampler. This surface sediment sampling depth, which includes the biologically active zone, was selected based on an evaluation of bathymetric changes between December 2001 and spring 2003, other site physical data, and potential exposure depths for ecological receptors. The evaluation of bathymetric changes is presented in Appendix B.

During the May 2004 site reconnaissance, it was determined that a few stations could not sampled by the power-grab sampler and vessel due to in-water obstructions (e.g., docks and piers) that prevented over-water access to the location. These stations will be sampled by one of two methods: 1) with a smaller vessel equipped with a Van Veen grab that collects surface sediments down to about 15 cm; or 2) with 10- to 15-cm-long hand cores collected by sampling personnel that wade to the locations from the land side. The method to be used will be selected based on the river levels and site accessibility at the time of the sampling.

2.1.3 Sample Analyses

All surface sediment samples will be analyzed for a standard list of analytes that includes: grain size, total organic carbon (TOC) , metals, and semivolatile organic compounds (SVOCs). Most samples will also be analyzed for chlorinated pesticidesand PCBs. Total sulfides and ammonia will be analyzed in surface sediments collected for bioassay testing. Total petroleum hydrocarbons (TPH), butyltins, VOCs, dioxins/furans, chlorinated herbicides, and hexavalent chromium will also be analyzed at appropriate sample stations (e.g., TPH near fuel facilities, butyltins near shipyards; see Tables 2-2 and 2-3). Selected physical parameters that provide preliminary engineering information (i.e., specific gravity, Atterberg limits) will be analyzed. Samples for specific gravity will be collected and analyzed at all stations. Samples for Atterberg analysis will also be collected at all stations, from which 10% of the samples will be selected for analysis. A registered geotechnical engineer or geologist will select appropriate samples for Atterberg analysis based on sample descriptions (see Section 4.6.2).

2.2 SUBSURFACE SEDIMENT

2.2.1 Data Needs

Subsurface sediment sampling is needed to support the site characterization, FS, groundwater impacts assessment tasks, and to confirm the physical CSM. A summary of the overall coring approach is provided in Table 2-4. The Round 2 subsurface sediment sampling program will occur in two phases: Round 2A and Round 2B. Round 2A will primarily include the collection of cores to support the site characterization and to help validate the physical CSM, and will also provide some FS information. Round 2B will collect subsurface samples to further support the FS and to assess potential impacts from the discharge of contaminated groundwater. The second round of subsurface sediment sampling is not dependent on the results of the first round of work but requires compilation of additional information (e.g., hydrodynamic model results, CSM update, groundwater evaluation process) before and during the first phase of work. Therefore, Round 2B will take place immediately following the completion of Round 2A. A third round of coring to be conducted during Round 3 will fill data gaps following the evaluation of both Round 2A and 2B data. The proposed round of sampling for each subsurface location is provided in Table 2-3. Each proposed subsurface sediment sampling location is shown in Figure 2-1.

For Round 2A, a total of 197 subsurface coring stations have been identified for purposes of site characterization (nature and extent). Of these, 49 have been identified to support FS purposes and 11 have been identified for further refinement of the physical CSM. The data from 59 of these stations may also be used in the assessment of potential groundwater impacts.

Another 30 cores have been identified for collection during Round 2B to assess potential impacts from the discharge of contaminated groundwater and to support the FS. Finally, 31 additional cores are tentatively identified for Round 3 to further support the FS and to potentially fill data gaps identified during the evaluation of Round 2 data (see Table 2-3).

Site Characterization

Round 2 subsurface data will be used with appropriate historical Category 1 data to provide site-wide information on the nature and extent of chemical distributions in sediment. This sampling program will take place in Round 2A. Vertical subsampling will occur in stratigraphic units at least 1-foot in thickness based on visual observations and field chemical screening techniques. Data will be evaluated to identify potential sources.

Feasibility Study

In addition to the collection of data needed to characterize the engineering properties of sediments (i.e., specific gravity and Atterberg limits), subsurface sediment samples will be collected for contaminant chemistry to determine the extent of contamination. This work will be performed in both Round 2A and 2B.

Groundwater Impact Assessment

A subsurface sediment coring event in areas of known or suspected past or present contaminated groundwater discharge will be performed in Round 2B to assess the impacts of contaminated groundwater COIs discharging to the river. The subsurface sampling approach to assess groundwater impacts will be determined on a site-by-site basis using appropriate existing Category 1 data, field observations during Round 2A sampling, information gathered to update the CSM, and data collected as part of an assessment of the impacts of COIs in groundwater on receptors in the river described in Section 7.2.3 of the Work Plan (Integral et al. 2004). Subsampling and analysis strategies for potential subsurface groundwater effects will be provided in a Round 2B FSP addendum. If determined to be applicable based on the information sources listed above, subsurface data collected during Round 2A may also be used to assess potential groundwater impacts. Possible locations where Round 2A cores may be used for this purpose are indicated in Table 2-3.

Physical CSM

Subsurface sediment samples will be collected from a range of channel and nearshore energy regimes (depositional, erosional, etc.) in the LWR to support validation of the physical CSM. This sediment coring effort will be conducted primarily in Round 2A, but depending on field observations, Round 2A data, and information from the hydrodynamic modeling, some physical CSM cores may be collected in Round 2B. Conventional parameters will be analyzed in discrete stratigraphic units to document vertical patterns in sediment texture. These data will support the proposed hydrodynamic modeling effort.

2.2.2 Sample Type

Subsurface sediment cores will be collected over water using a vessel-deployed vibracore. The vibracore will be equipped with either a 14-ft or 20-ft core tube (4-inch diameter). Most target locations will be sampled with the 14-ft tube. However, in some areas, particularly some nearshore areas where deep subsurface sources of contamination are known or suspected, a 20-ft core tube will be used.

The locations identified herein for 20-ft core tubes were based on historical sediment chemical data, existing upland source and groundwater information, and the rationale provided by EPA and its partners. The final plan for Round 2A sample locations will be based on this information and the results of the site reconnaissance (see Section 4.6.1). It is estimated that about 54 of the Round 2 cores will be sampled with 20-ft core tubes, divided between those cores designed to address nature and extent of contamination, FS needs, and potential impacts from contaminated groundwater. It is anticipated that the 20-ft core tube locations will generally be located in nearshore areas to account for higher elevations encountered inshore and the additional length potentially needed to reach buried sediments potentially impacted by groundwater contaminant discharges.

Core sample recovery (the length of the sediment sample retained in the tube), and the depth to refusal (the maximum depth the vibracore is driven into the bottom) is a function of location-specific sediment textures and stratigraphy. In most unconsolidated sand and silt-dominated sediments, vibracore recoveries range from 70 to 90%, and the depth to refusal can range to 100% of the core tube length.

At each core station, a single core will be driven to the maximum core tube length or the refusal depth. All cores will be subsampled vertically, with no compositing of sediment from adjacent cores. The strategies for subsampling sediment cores that support site characterization, FS, and the validation of the physical CSM are described below and summarized in Table 2-4. The strategy for subsampling cores that primarily support the groundwater impacts assessment tasks is under development with EPA and will be provided in a Round 2B FSP before Round 2B sampling activities.

Site Characterization (Nature and Extent)

Each core listed in Table 2-3 will support site characterization. Sampling locations were selected based on the EPA plan presented in Appendix A. All nature and extent (N&E) sediment cores will be collected using 14- or 20-ft core tubes as shown in Table 2-3, and will be described visually relative to lithology and sediment characteristics to define lithologic units, as described in Section 4.6.3. Field screening methods, described in Section 4.6.4, may also help delineate these distinct units and visually assess the presence/absence of contamination. Sample intervals from each core will consist of individual lithologic units that are at least 1 foot thick below the 0- to 30-cm surface sample (see Section 2.1.2). Lithologic units less than 1 foot thick will be combined with the adjacent unit above or below, whichever is considered appropriate by the chief field geologist based on similarities of grain size or other observed characteristics. The surface 0- to 30- cm surface interval will be retained from each core and archived. The individual sample intervals will range up to an approximate maximum of 4 feet in thickness. Lithologic units greater than 4 feet thick will be divided into subsamples, with interval lengths to be determined at the discretion of the sampling personnel based on total length of the unit and field observations.

The two uppermost core sample intervals will be analyzed initially for all target analytes (the upper 0-30 cm at each core location will be sampled and analyzed as part of the surface sampling program). In addition, the bottommost interval in each core will also be analyzed initially for those analytes with short holding times [i.e., VOCs, TPH as gasoline (TPH-G), and hexavalent chromium] that are targeted for analysis in that core (see Table 2-3). Following this subsampling, vertical composites of the bottommost unit as well as all identified lithologic units between the uppermost two and the bottommost one will be sampled and archived under appropriate conditions. The need to analyze archived core samples (within prescribed holding times ranging from 6 months to one year) will be based on an evaluation of the preliminary Round 2A analytical results, information collected for assessment of potential groundwater impacts, and the preliminary hydrodynamic model results. The LWG will include its recommendation and rationale for analyzing archived core samples in an addendum to this FSP that will be submitted within 120 days following completion of the Round 2A coring. Final decisions on which archived samples to analyze will be made in conjunction with EPA.

Exceptions to the sample analysis approach described above may be made if lithologic units below the uppermost two are distinctly finer-grained than the uppermost units, or display evidence of contamination based on visual observations or field screening techniques (e.g., strong odor, sheens, organic vapor detector response). In such cases, these deeper units may be analyzed preferentially or in addition to the upper two units. The chief field geologist will make these sample analysis decisions on a core-by-core basis.

Feasibility Study

Sediment cores collected for FS purposes will provide information for both general site characterization, understanding the nature and extent of sediment contamination in nearshore areas, understanding the potential for groundwater impacts, as well as information that may be of further use in the FS. The primary purpose of FS sediment cores is to obtain preliminary information on the depth of potential contamination in areas that may have higher likelihood for historical contamination at greater depths. Cores targeted for FS purposes will be collected using 20-ft vibracore tubes. A total of 49 Round 2A subsurface coring stations have been identified for FS purposes (see Table 2-3).

The FS sediment core locations were chosen based on the following general criteria for nearshore areas that:

- Have not been dredged with any known regularity and therefore have greater potential for accumulation of contaminated sediments
- Are near potential upland discharges and have (or could have) a relatively long history of surface water or direct discharges that could have impacted sediments over time
- Are near potential historical and/or recent discharges of contaminated groundwater that could have impacted sediments at depth
- Are located near docks or other shoreline structures that would likely require future maintenance that might include dredging or other disturbance of deeper sediments to maintain site uses.

A portion of the proposed total subsurface coring stations meeting one or more of these criteria was chosen for FS purposes. Generally, the sediment cores were selected to provide information over the entire site and to avoid a high density of samples located in any one portion of the site. If relatively deep contamination is found in a particular area, it is assumed that this area could then be targeted for additional sample density in future subsurface coring events.

Information used for comparison against the above criteria include bathymetry, aerial photos, the Draft Groundwater Data Review Report (GSI 2003), and DEQ information on historical and ongoing discharges from various upland sites [as summarized in the *Revised Potential Early Action Identification and Evaluation Technical Memorandum*[2] (Integral et al. 2004)].

[2] Note this document was submitted in draft Work Plan to EPA, and is no longer contained in the Progammatic Work Plan at EPA's request. However, the document contains summaries of upland source information that were used in the above evaluations.

Offshore locations were generally not chosen for FS coring because, in most cases, these areas have been dredged, and a long-term accumulation of substantial depths of contaminated sediment in these areas would not be expected.

For FS sediment cores, the sampling approach for the upper two and bottommost sample intervals will be identical to the approach described above for nature and extent cores. If the above sampling approach results in the collection of samples from only the upper 8 feet of the sediment core, then up to two additional samples from the core to a depth of the bottom of the core will also be collected and submitted for analysis. These additional samples will be collected in intervals at least 2 feet thick. Lithologic units less than 2 feet thick will be composited with adjacent units, if necessary, to meet the 2-foot minimum sample interval thickness. Thus, the minimum and maximum number of samples that would be submitted in FS cores are two and four, respectively. The minimum and maximum depths that would be sampled are 7 feet and 20 feet, respectively.

As with the site characterization cores, all unanalyzed samples from the FS cores will be archived for potential future chemical analysis; however, sample intervals for archived FS core samples will be a minimum of 2 feet in thickness rather than the 1-ft minimum thickness for site characterization core sample intervals.

Physical CSM

At 11 N&E core locations selected along the length of the ISA, physical data for the CSM and hydrodynamic modeling effort will also be collected. The proposed CSM sample locations are indicated in Table 2-3. In addition to the analyses for nature and extent described above, each subsurface lithologic unit at least 1 foot in thickness identified in these cores will be subsampled and analyzed for physical characteristics.

2.2.3 Sample Analyses

Subsurface sediment collected in Round 2A will be analyzed for the following suites of analyses:

Site Characterization and FS Cores: Subsurface sediment samples will be analyzed for grain size, total organic carbon (TOC), SVOCs, and metals at all stations, and for pesticides and PCBs at most locations. At selected locations, VOCs, tributyltin (TBT), dioxins/furans, TPH, chlorinated herbicides, or hexavalent chromium will also be added to the analyte list based on proximity to potential sources of these compounds (see Table 2-3). Selected physical parameters that provide preliminary engineering information (i.e., specific gravity, Atterberg limits) will also be analyzed. Samples for specific gravity will be collected at all stations. Samples for Atterberg analysis will also be collected at all stations, and then 10% of the samples will be selected for analysis.

Physical CSM: Sediment samples will be analyzed for grain size and specific gravity. Table 2-3 lists the target analytes for each subsurface sediment sampling location.

Round 2B: Specific parameters to be analyzed in the Round 2B subsurface sampling program will be presented in the Round 2B FSP addendum.

3.0 PROJECT ORGANIZATION

This section presents the organizational structure for sampling and analysis activities associated with the Round 2 investigation, including fieldwork, laboratory analyses, and data management.

3.1 TEAM ORGANIZATION AND RESPONSIBILITIES

The Round 2 sampling and analysis activities will be performed by contractors retained by the LWG. The qualifications of this team are presented in the RI/FS Work Plan (Integral et al. 2004). The organizational structure of the lead sampling and analysis personnel and associated laboratories for Round 2 is shown in Figure 3-1 and described below. Additional information on project organization, coordination, and communication between EPA, the LWG, and the consultant team is provided in the RI/FS Work Plan.

3.1.1 CERCLA Project Coordinator

Keith Pine (Integral) will be the CERCLA Project Coordinator, responsible for managing the Portland Harbor RI and coordinating the overall RI/FS efforts. In this role, he will oversee the RI technical work, participate in agency negotiations, and coordinate RI/FS activities with the LWG consultant team and other technical consultants. Mr. Pine will work closely with the Sampling and Analysis Coordinator to ensure that the objectives of the Round 2 field investigation are achieved. In the event that changes in the FSP are needed, he will discuss proposed changes with EPA's Project Manager or other designated EPA staff. Changes to the FSP will not be made without prior approval from the EPA Project Manager unless conditions in the field or laboratory require immediate response.

3.1.2 Sampling and Analysis Coordinator

Gene Revelas (Integral) will be the Sampling and Analysis Coordinator, responsible for all facets of the sampling and analysis programs. He will report directly to the CERCLA Project Coordinator. His specific responsibilities include the following:

- Coordinate the field and laboratory analyses
- Ensure that laboratory capacity is sufficient to undertake the required analyses in a timely manner
- Ensure adherence to the schedule by tracking sampling, laboratory analysis, validation, and data management tasks
- Provide solutions to problems if they occur

- Inform the CERCLA Project Coordinator of any decisions that involve changes to the FSP and QAPP.

3.1.3 Field Coordinator

Ian Stupakoff (Integral) will be the Field Coordinator and will be responsible for overall coordination of all the field sampling tasks. Specifically, he will be responsible for the following:

- Oversee the planning and coordination for all sampling efforts
- Oversee all aspects of the sampling to ensure that the appropriate procedures and methods are used
- Oversee the establishment and operation of the field laboratory and equipment facility near the study site

He will work closely with the Sampling and Analysis Coordinator and will be immediately notified if problems occur in the field. If changes to the FSP or QAPP are warranted, he will immediately notify the Sampling and Analysis Coordinator.

Due to the magnitude and length of the Round 2 sampling program, the Field Coordinator will be assisted in his role by field task leaders. Joe Thompson (Integral) will be primarily responsible for tracking the details of the surface sampling program and updating Mr. Stupakoff, as needed, on the program's progress and any problems encountered. Susan FitzGerald (Integral) will provide a similar function for the subsurface sampling program.

3.1.4 Field Crews

Field staff for all sampling events will be drawn by Integral from the LWG common consultant team. The operators of sampling vessels and equipment, as appropriate, will supply additional staff. A qualified scientist will be on board the sampling vessel to determine proper sampling station location. Station positioning will generally be the responsibility of the vessel operator. In the event the vessel operator does not have this capability or cannot meet the positioning requirements of the project, a qualified subcontractor will provide station-positioning services. For all sampling tasks, the field crew will include the following individuals: site safety officer, field task leader, and field crew.

The site safety officer will have the following responsibilities:

- Correct any work practices or conditions that may result in personnel injury or exposure to hazardous materials
- Determine appropriate personal protection levels and necessary clothing and equipment, and oversee its proper use

- Verify that the field crew is aware of the provisions of the health and safety plan and instructed in safe work practices
- Verify that the field crew has received the required safety training.

The field task leader will have the following responsibilities:

- Ensure that all activities adhere to the FSP and QAPP
- Inform the field coordinator of any decisions that involve changes to the FSP and QAPP
- Mobilize and prepare for field work
- Ensure sample custody, including chain-of-custody.

Various field staff from the consultant team will assist in sample collection, handling, and storage. They may maintain the field sampling logs and notebooks and will be responsible for properly labeling sample containers. It is the responsibility of all field staff to report any problems or potential changes to the FSP and QAPP to the field task leader.

Key Field Personnel for Subsurface Sampling

In addition to the general project roles described above, four key geologists from Integral will provide technical expertise and project oversight to ensure continuity in the subsurface sampling program. Gene Revelas or Joe Thompson will coordinate the core sampling vessel for all core sample acquisition, and Keith Pine or Susan FitzGerald will coordinate all core processing and core sample identification. These individuals may also exchange roles as needed during the sampling program. Other qualified Integral scientists will work on this project, and their efforts will be directed by these key project personnel. Resumes describing the qualifications of these four scientists are detailed in Appendix C.

Both Gene Revelas and Joe Thompson have extensive experience in vibracore collection in the Pacific Northwest and both understand the Round 2 subsurface sampling program rationale. They will coordinate any modifications to the field sampling program, if needed, and any significant changes to target locations or core lengths will be coordinated with EPA before implementation.

Keith Pine and Susan FitzGerald are professional licensed geologists with experience in visual sediment core description, core logging, and sediment field screening techniques. During the first few days of the coring program, they will work together to ensure that a consistent approach to core section identification and subsampling is implemented (see Section 4.6.3 for details). They will also train other qualified staff on the core description and sampling approach. They will coordinate the core processing for the duration of the coring program.

3.1.5 Quality Assurance Managers

Quality assurance managers have been assigned for all aspects of Round 2 sampling and analysis. All quality assurance managers for Round 2 will report to the Sampling and Analysis Coordinator.

Field QA Manager

Gene Revelas (Integral), the Sampling and Analysis Coordinator, will also serve as the QA manager for all Round 2 field sampling activities. He will oversee all aspects of the sampling events to ensure that the appropriate procedures and methods are used.

Chemistry QA Manager

Maja Tritt (Integral) will be the QA manager for analytical chemistry. She will perform laboratory oversight for the analytical laboratories and will direct the quality assurance review of chemical data.

Bioassay QA Manager

Helle Andersen (Windward Environmental) will be the QA manager for bioassay testing. She will perform laboratory oversight for the bioassay laboratory and will direct the quality assurance review of the bioassay data.

3.1.6 Data Management

Tom Schulz (Integral) will have primary responsibility for data management. Integral will continue to utilize the EQuIS database as the primary repository of environmental data. Mr. Schulz works directly with this database and is familiar with its structure and operation. During Round 1, he worked with the laboratories to ensure that data were delivered in the correct format for entry into the EQuIS database, and these procedures and coordination will continue in Round 2. Use of this system will also ensure the easy transfer of data in the required format to EPA.

3.1.7 Laboratory Services

Laboratory services will be used during Round 2 for chemical and biological analyses. All of the selected laboratories have demonstrated to the LWG that they have acceptable performance records and are capable of performing the analyses required. Laboratory qualifications and SOPs are provided in the Round 2 QAPP.

3.2 COMMUNICATION/INFORMATION FLOW

During field operations, the field staff will report to the field task leader (Joe Thompson for surface sediment sampling and Susan FitzGerald for subsurface sediment sampling) for their sampling event (Figure 3-1). The field task leaders will report to the Field Coordinator (Ian Stupakoff). The chemical laboratories will report to the Chemistry QA Manager (Maja Tritt), and the biological laboratory will report to the Bioassay QA Manager (Helle Andersen). The Field Coordinator (Ian Stupakoff), laboratory oversight personnel (Maja Tritt), and data manager (Tom Schulz) will report to the Sampling and Analysis Coordinator (Gene Revelas). Issues requiring the attention of the LWG or EPA will be discussed with the CERCLA Project Coordinator (Keith Pine), who will communicate the issues to the LWG. To the extent possible, official communications between EPA and the LWG will occur through their respective project managers.

Field change request forms (Appendix D) will be completed for any change to the FSP or QAPP; EPA approval will be required for all changes. Any field staff or manager may request changes. The change request form should be submitted to the Sampling and Analysis Coordinator. If the Sampling and Analysis Coordinator approves the change, he will submit the form to the CERCLA Project Coordinator. The CERCLA Project Coordinator may notify the LWG and will submit the forms to the EPA Project Manager for approval. If circumstances require immediate action, verbal authorization may be obtained and the change may be implemented, but a field change request form must still be completed and submitted as soon as possible to document the change and ensure that all managers are informed.

3.3 COORDINATION WITH EPA

3.3.1 Field Sampling Notification

The CERCLA Project Coordinator will notify the EPA Project Manager and tribal representatives at least one week prior to beginning field activities so that EPA can schedule any necessary oversight tasks. EPA's Project Manager will contact the CERCLA Project Coordinator and the tribal representatives to coordinate these activities and determine appropriate logistics. The CERCLA Project Coordinator will notify EPA, in writing, when field activities are completed.

3.3.2 Lab Audits And Split Samples

The chemical laboratories will be audited prior to analysis of samples. An additional audit will be conducted, if necessary, based on laboratory performance. In the event that EPA or their designated representative wishes to accompany the LWG project team during these audits, the EPA Project Manager should make this request to the CERCLA Project Coordinator. Following this initial contact, the appropriate QA managers for the LWG project team should interact directly with their counterparts at EPA.

Split and/or verification samples for chemical testing can be provided to EPA or its designated representative (details on the QC samples planned for this sampling program are provided in Section 4.9). EPA's Project Manager should contact the CERCLA Project Coordinator at least three days in advance to coordinate this activity and determine appropriate logistics. It is recommended that split samples be taken at those stations where blind field replicates are taken so that EPA's comparison samples are evaluated relative to the field and analytical variability measured by the LWG project team.

3.4 PROJECT SCHEDULE

Actual start dates for the Round 2 sampling will be determined following EPA approval of the Work Plan, Round 2 FSP, and Round 2 QAPP. Other conditions that may affect the sampling schedule are weather, river flows and stages, and equipment conditions and availability. Currently, it is anticipated that the Round 2A field investigations will begin in the summer of 2004, and Round 2B sampling will begin in early 2005. Reporting of Round 2 sediment sampling results is discussed in Section 7.2.

4.0 SAMPLE COLLECTION PROCEDURES

The following sections describe the detailed procedures and methods that will be used during Round 2 sampling. This includes sampling procedures for sediment chemistry and bioassay samples; record keeping; sample handling, storage, and shipping; and field quality control procedures.

4.1 SAMPLING VESSELS

Marine Sampling Systems (MSS), Burley, WA, will provide two sampling vessels for the sediment sampling program. The larger vessel, the R/V *Nancy Anne*, is a flat-deck (270 sq. ft.), 36-foot-long catamaran with twin, 120-horsepower engines. It is equipped with a hydraulically operated A-frame with a boom and a 3,000-lb capacity hydraulic winch. The vessel draft ranges from 18 inches forward to 42 inches aft, and the vessel can deploy a hydraulic power grab or vibracore provided by MMS.

The *Nancy Anne* will be used for all vibracore collection and will be available for power grab deployment as a backup to the smaller *Peter R*. The R/V *Peter R* is a flat-deck (221 sq. ft.), 26-foot-long catamaran with twin, 270-horsepower engines. It is equipped with a hydraulically operated A-frame with a boom and a 1,000-lb capacity hydraulic winch. The vessel draft ranges from 12 inches forward to 18 inches aft. The *Peter R* will be the primary power grab deployment vessel.

Smaller boats will be available for the duration of the field effort and will be used to transport supplies (e.g., sample jars, coolers, ice), samples, and personnel to the sampling platforms from the shore-side core processing facility or elsewhere, and to collect Van Veen grab samples at a small number of stations that cannot be accessed by the larger vessels described above. The goal of the field sampling program will be to keep the grab or core sampling vessels working as continuously and efficiently as possible by using the smaller boats to ferry supplies and offload samples to be processed (e.g., sealed core tubes) from the larger sampling vessels.

4.2 STATION POSITIONING AND VERTICAL CONTROL

Latitude and longitude coordinates will be obtained using a differential global positioning system (DGPS). The standard projection method to be used during field activities is Horizontal Datum: North American Datum of 1983 (NAD83), State Plane Coordinate System, Oregon North Zone. The positioning objective is to accurately determine and record the positions of all sampling locations to within ± 2 meters.

Station positioning from the sampling vessel will be accomplished using a DGPS, which consists of a GPS receiver on the sampling platform and a differential receiver located at a horizontal control point. At the control point, the GPS-derived position is compared with the known horizontal location, offsets or biases are calculated, and the correction factors are telemetered to the GPS receiver located on the sampling platform. Positioning accuracies on the order of ± 2 meters can be achieved by avoiding the few minutes per day when the satellites are not providing the same level of signal. The GPS system provides the operator with a listing of the time intervals during the day when accuracies are decreased. Avoidance of these time intervals permits the operator to maintain better positioning accuracy. The GPS receiver routes latitude and longitude to an integrated navigation system, which displays the platform's position in plan view. Navigation data, such as range and bearing from the target sampling location, are provided at a user-defined scale to guide the sampling platform's pilot to the desired location.

Vertical positioning is required to establish the elevation of the riverbed at the sampling locations. While the sampling device is in place at the sampling station, depth to mudline will be measured using a lead line or fathometer immediately prior to or during the sampling. Vertical measurements will be recorded to the nearest 0.1 foot. Water depths will be converted to elevations [feet Columbia River Datum (CRD)] based on the river stage at the time of sampling as recorded at the Morrison Street Bridge.

During sediment sampling, the combination of real-time river levels and subsurface obstructions may preclude collecting a sample at the target location. Attempts will be made to relocate the sample to an area that has comparable sediment characteristics and rationale objectives for the initial location. The EPA Project Manager will be contacted regarding the proposed revised sampling location, and the revision will be appropriately documented.

4.3 FIELD LOGBOOK AND FORMS

All field activities and observations will be noted in a field logbook during fieldwork. The field logbook will be a bound document containing individual field and sample log forms. Information will include personnel, date, time, station designation, sampler, types of samples collected, and general observations. Any changes that occur at the site (e.g., personnel, responsibilities, deviations from the Work Plan or FSP) and the reasons for these changes will be documented in the field logbook.

Logbook entries will be clearly written with enough detail so that participants can reconstruct events later if necessary. Requirements for logbook entries will include the following:

- Logbooks will be bound, with consecutively numbered pages.
- Removal of any pages, even if illegible, will be prohibited.
- Entries will be made legibly with black (or dark) waterproof ink.
- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be noted, as well as the time of the observation itself).
- Each consecutive day's first entry will be made on a new, blank page.
- The date and time, based on a 24-hour clock (e.g., 0900 a.m. for 9 a.m. and 2100 for 9 p.m.), will appear on each page.
- When field activity is complete, the logbook will be entered into the Portland Harbor project file.

In addition to the preceding requirements, the person recording the information must initial and date each page of the field logbook. If more than one individual makes entries on the same page, each recorder must initial and date each entry. The bottom of the page must be signed and dated by the individual who makes the last entry. The field team and task leader, after reading the day’s entries, also must sign and date the last page of each daily entry in the field logbook.

Logbook corrections will be made by drawing a single line through the original entry allowing the original entry to be legible. The corrected entry will be written alongside the original. Corrections will be initialed and dated and may require a footnote for explanation.

The type of information that may be included in the field logbook and/or field data forms includes the following:

- Names of all field staff
- Sampling vessel
- A record of site health and safety meetings, updates, and related monitoring
- Station name and location
- Date and collection time of each sample
- Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort
- Sample description

- Depth of mudline below water surface
- River stage at the Morrison Street Bridge immediately prior to sampling
- Any deviation from the FSP.

A sample collection checklist will be produced prior to sampling and completed following sampling operations at each station. The checklist will include station designations, types of samples to be collected (e.g., one jar for metals), and whether blind field replicates or additional sample volumes for laboratory QC analyses are to be collected.

Field data sheets and sample description forms will be completed for all samples and kept in the project file. Information such as habitat descriptions, sediment, water, and biota sampling data will be noted on the field data sheets. Depending on the activity, the type of field data sheet and the information recorded on it may vary. Examples of the types of forms that may be used are provided in Appendix D.

The field task leader is responsible for ensuring that the field logbook and all field data forms are correct.

4.4 EQUIPMENT AND SUPPLIES

Equipment and supplies will include sampling equipment, utensils, decontamination supplies, sample containers, coolers, logbooks and forms, personal protection equipment, and personal gear. Protective wear (e.g., hard hats, gloves), as required for health and safety of field personnel, will be as specified in the HSP (SEA 2002). Equipment checklists are included in Appendix D.

Sample containers and preservatives, as well as coolers and packing material, will be supplied by the analytical laboratory. Commercially available pre-cleaned jars will be used, and the laboratory will maintain a record of certification from the suppliers. The bottle shipment documentation will record batch numbers for the bottles. With this documentation, bottles can be traced to the supplier, and bottle wash analysis results can be reviewed. The bottle wash certificate documentation will be archived in the Integral project file. Field personnel will not obstruct these stickers with sample labels.

Sample containers will be clearly labeled at the time of sampling. Labels will include the project name, sample location and number, sampler’s initials, analysis to be performed, date, and time. The nomenclature used for designating field samples is described in Section 6.4.

4.5 EQUIPMENT DECONTAMINATION PROCEDURES

Sediment handling equipment that comes in direct contact with the sample, such as scoops, spoons, and mixing bowls, will be decontaminated in the following manner prior to use at each station and between field replicates:

- Rinse with site water.
- Wash with brush and Alconox™ or other phosphate-free detergent.
- Double rinse with distilled water.
- Rinse with 0.1 N nitric acid.
- Rinse with deionized water.
- Rinse with methanol or ethanol (omit if sampling for volatiles).

The sediment grab samplers will be rinsed between stations with site water. If the grab sampler contacts visibly contaminated sediment, it will be thoroughly washed using Alconox™ or other phosphate-free detergent and rinsed with site water before sampling a new station. If a residual creosote or petroleum sheen remains on the sampling equipment or is difficult to remove using the standard decontamination procedures above, a final hexane rinse may be added.

Decontamination of stainless-steel bowls and utensils will be performed before sampling and between each composite sample. Sample handling equipment also will be wrapped in aluminum foil following the methanol rinse. Before being used to remove sediment from the samplers, all equipment will be rinsed with deionized water. To minimize sample contamination, gloves will be replaced or thoroughly washed using Alconox™ or other phosphate-free detergent and rinsed with distilled water before and after handling each sample, as appropriate. Rinse waters will be diluted with site water and discarded into the river.

For the vibracore sampling, the aluminum core tubes and stainless-steel core catchers used are fully decontaminated, and the ends wrapped in foiled and sealed onshore prior to on-water operations. Additional tubes are prepped onshore as needed throughout the sampling program to ensure that coring operations can continue without the need to decontaminate tubes on the sampling vessel.

4.6 SAMPLE COLLECTION AND PROCESSING PROCEDURES

4.6.1 Site Reconnaissance

The complexity of the site and the scope of the Round 2 field activities necessitated a pre-cruise field reconnaissance conducted on May 24-25, 2004. During this reconnaissance, representatives from the LWG and EPA and its partners visited nearshore target locations in a vessel that was approximately the size of the power grab sampling vessel. The goals of this reconnaissance effort were to :

- Verify target positions relative to potential sources and possibly adjust target locations based on source locations.
- Verify water depths at those locations to prioritize sampling at certain locations that require high water levels for access.
- Assess boat access around shoreside structures and obstacles. Confer with EPA for alternative sampling methods or locations.
- Assess height restrictions and potential hazards posed by the deployment of a coring device that is greater than 20 feet in height. Confer with EPA for alternative sampling methods or locations.

Based on the field reconnaissance, the location or sampling approach for about 84 stations were modified. Approximately two-thirds of the affected stations were repositioned to either 1) avoid in-water obstructions (piers, dolphins, submerged pilings, etc.), or 2) be more optimally placed offshore and/or just downstream of an outfall. About 10 stations were repositioned into slightly deeper water offshore to allow vessel access. A few stations were repositioned to provide better spatial coverage of an area. About 10 stations were eliminated due to spatial redundancy combined with access issues, and two stations were added to provide data near an outfall. A table summarizing the station changes resulting from the site reconnaissance is provided in Appendix E.

4.6.2 Surface Sediment Chemistry and Bioassay Testing

Surface sediment grab samples for chemistry analyses and bioassay tests will be collected using standard protocols and guidelines (EPA 2001c; USACE et al. 1998; PSEP 1986). At stations where both chemical and bioassay analyses will be conducted, additional sediment will be collected and homogenized so that both chemical and bioassay analyses can be conducted on the same batch of homogenized sediment. Standard operating procedures (SOPs) for collection of sediment are described in Appendix F.

Collection

Prior to sampling, target station coordinates will be entered into the navigation system. Once the sampling equipment has been deployed, the actual position will be recorded when the equipment is on the riverbed. All samples will be collected within 10-15 meters of the target sampling location, when possible. Most surface sediment samples will be collected in a consistent, repeatable manner with a stainless-steel, 0.3-m^2 hydraulic power-grab sampler provided by MSS. A few stations located in areas difficult to access in a larger vessel will be sampled with a

Van Veen sampler and/or by hand using a small hand-core sampler. Samples must also meet additional acceptability criteria described in Appendix F.

The power-grab sampler will be attached to the winch cable with a ball-bearing swivel to prevent twisting movements during deployment. The device will be raised and lowered through the water column by the vessel's winch at a rate no greater than 20 meters per minute. This will ensure that the sampler doesn't flip over on descent and will prevent disturbance of the sediment surface upon retrieval. Once the sampler is brought on board, it will be placed on a stand or table. Access doors in the cover on the top of the sampler will allow visual characterization of the sediment surface in order to assess sample acceptability. Before characterization, the overlying water in the sampler will be removed by siphoning.

The maximum penetration of the power-grab sampler is 30 cm. A minimum penetration of 20 cm will constitute an acceptable grab. A minimum of three consecutive casts of the grab will be attempted while trying to achieve the 20-cm minimum penetration. If a 20-cm penetration cannot be attained, the sampling crew will continue on to the next station. Following consultation with the Sampling and Analysis Coordinator and EPA, the target coordinates at the unsuccessfully sampled station may be adjusted.

Certain parameters and qualitative environmental observations will be recorded. The following physical characteristics of the surface sediment grab samples will be described and recorded on field logs or sample description forms (see Appendix D): sediment texture; sediment color; presence, type, and strength of odors; grab penetration depth (nearest cm); degree of leakage or sediment surface disturbance; and any obvious abnormalities such as wood/shell fragments or large organisms.

Because an undisturbed sediment surface is necessary for chemical sampling, the physical characterization of the sediment in the grab sample will be delayed until after the chemical samples have been taken. Sediment for physical (e.g., grain size) and chemical analyses will be collected using a stainless-steel spoon or spatula. Sediment that is in contact with the sides of the sampler will not be sampled. Large organisms and pieces of debris will be removed and noted in the sample log sheet. The sediment sample will then be placed into a stainless-steel mixing bowl for homogenization. A minimum of a 6-liter sample size will be required for both toxicity and chemistry analysis. A single cast of the power grab will provide adequate sediment volume; therefore, only one power grab sample will collected at each target location. For the subset of stations sampled with the Van Veen grab or hand cores, multiple casts or cores will be collected from a single location, as needed, to collect adequate sediment volume for chemical and biological testing.

As noted in Table 2-2, sampling of selected stations will be monitored for the retrieval or disturbance of items of archaeological significance.

Sample Handling and Storage

The homogenized sample will be distributed to the appropriate sample containers according to the sample requirements identified in Table 4-1. Because the compositing and homogenizing process may release volatile organics, the sediment subsamples for VOC and total sulfides analyses will be taken from the upper 30 cm of the grab prior to removal of other sediments for homogenization (see Appendix F).

Sufficient sample amounts (16 oz) will be collected at each station so that Atterberg limits can be analyzed in addition to all other sample analyses planned for that station. Approximately 10% of all samples will be analyzed for Atterberg limits. A geologist will review the field descriptions and select the appropriate samples that will be submitted for Atterberg limits analysis, the number of samples, and location of the samples. The intent will be to obtain a representative number and distribution of samples for this analysis.

Except for volatile and sulfides samples, all sample containers will be filled, leaving 0.5-1 inch of headspace to prevent the jars from breaking during storage. Containers for VOC samples will be completely filled so that no airspace remains. Samples for bioassay analysis will also be filled to the very top of the sample jar, leaving no available headspace. Sediment samples will be stored on ice prior to unloading onshore. At the end of each day, samples will be stored in refrigerators/freezers at a pre-determined laboratory space prior to shipping to the analytical laboratories. Sediment samples for bioassay testing will be stored in refrigerators. At approximately 5% of the stations, rinsate blanks will be prepared and submitted to the laboratory for analysis.

Bioassay Testing

The sediment samples for the bioassay testing will be collected in batches of 20-25 samples per week all within one sampling season. The two bioassay tests, 28-day *Hyalella* and 10-day *Chironomus*, will be initiated within 2 weeks of sediment collection. If a test fails to meet the test acceptability criteria or other QA issues arise that invalidate the data, EPA will be consulted before another test is initiated. The second bioassay test will be initiated within 8 weeks of sediment collection. If the sediment holding time extends beyond 8 weeks and acceptable tests with both organisms have not been performed, the sediment will be re-sampled and re-tested.

Given the weekly sampling of bioassay sediment samples, there will be close communication between the field and laboratory crew to ensure that test initiations occur within 2 weeks of field collection. If issues arise in the laboratory that limit the ability to initiate the bioassay tests within 2 weeks, the field collection of sediments for toxicity testing will cease. Sediment collection will resume when the QA issues have been resolved in the laboratory.

4.6.3 Subsurface Sediment

Core samples will be collected from the locations shown in Figure 2-1 (target coordinates listed in Table 2-3) using a vibracorer equipped with either 14- or 20-ft core tubes. The vibracorer offers a high rate of production, superior retention of shallow samples, and a greater sample volume compared to conventional drilling equipment. It also provides greater penetration capabilities than piston-type or conventional gravity corers when encountering compact subsurface sediments. Specific core collection, core processing, and sample handling methods are described in this section. SOPs for collection of subsurface sediment are presented in Appendix F.

Collection

Subsurface sediment will be collected using a customized vibracorer deployed from the R/V *Nancy Anne* operated by MSS. The vibracorer uses a hydraulic system that vibrates and drives a 4-inch outside diameter, aluminum core tube into the sediment. A continuous sediment sample is retained within the tubing with the aid of a stainless-steel core cutter/catcher attached to the bottom of each aluminum tube. A core liner is not used with this device.

Following positioning to a given sampling station, as described in Section 4.6.1, the vibracorer will be deployed off the foredeck of the vessel and slowly lowered to the sediment surface. Vibracoring will continue for a length of time necessary to obtain adequate core penetration (sample depth). The core penetration depth will be estimated by means of a transducer attached to the top of the vibracorer rack and will be recorded for each station on the core log sheet.

After collection of the core sample, the vibracorer will be slowly raised to the deck of the research vessel. Before removing the aluminum core tube from the vibracorer, the core cutter/catcher will be visually inspected to ensure that proper penetration was attained and that there was no obvious loss of sediment from the tube. Any presence of noticeable odors or sheen at the end of the tube or in the water will also be noted.

The core penetration depth and physical characteristics (e.g., color, texture, odor) of the sediment sample as observed at the ends of the tube will be recorded on field log sheets (see Appendix D).

Cores will be cut into manageable sections (3-4 feet) aboard the vessel immediately after their retrieval. They will then be capped with aluminum foil and plastic caps, and sealed with duct tape. Following sectioning, the cores will be stored on ice on board the vessel in a core box and transported periodically throughout each field day by small boat to a field-based laboratory in Portland where they will be stored upright on ice or refrigerated at $4^{o}C$ to await processing.

As noted in Table 2-3, sampling of selected stations will be monitored for the retrieval or disturbance of items of archaeological significance.

Sample Handling and Storage

Cores will be processed concurrently with core collection. Every effort will be made to process the cores within 24 hours of collection. Cores awaiting processing will be sealed tightly at both ends and stored upright in a refrigerator. If core collection outpaces processing such that significant delays in core processing appear likely, core collection will be suspended to allow the core processing to catch up. The field laboratory will be equipped with a core-cutting table, core-processing tables, a decontamination area, and a storage area with appropriate refrigeration. Appropriate lighting will be installed in the core processing area in order to collect consistent, high quality photographs of the opened cores. Once the field laboratory is located, care will be taken to create a core-processing area that minimizes the potential for outside contamination.

Each core tube will be fixed to the core-cutting table and cut along the long axis using a circular saw. The tube is rotated 180^{o} and cut again. After each core is cut, the entire core tube will be moved to a stainless-steel sampling tray and opened. Each sediment core will then be systematically logged, described, and photographed.

After each core is cut open, an experienced geologist will describe the sediment on a core log (see Appendix D). The qualifications of key personnel for the subsurface sampling effort are presented in Appendix C.

The following information will be recorded for each core:

- Physical sediment description (i.e., sediment type, density/consistency, color)
- Odor (e.g., hydrogen sulfide, petroleum)
- Visual stratification and lenses
- Vegetation
- Debris
- Evidence of biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence of oil sheen
- Other distinguishing characteristics or features.

The visual description of sediment lithology (dominant grain sizes) will be the primary criteria for determining sample intervals (i.e., lithologic units) in the cores.

For consistency, core descriptions and terms used will follow the criteria below, which are modified from methods presented in ASTM D 2488-00 (ASTM 2000).

1. Visual estimates of the grain-size percentages of sediment units within each core will be recorded on the core logs so that the total sum will add up to 100%. Estimates of gravel, sand, and fines (silt and clay) content will generally be made to the nearest quartiles:

   - 0% to 25%
   - >25% to 50%
   - >50% to 75%
   - >75% to 100%.

   The sediment may also be described narratively on the log based on the estimated grain-size percentages. The dominant constituent grain size will be the primary unit descriptor, with the abundance of other grain sizes present described using the following terms:

   - The grain-size adjective (e.g., gravelly, sandy, silty, or clayey), if estimated to constitute more than 25% of the sediment
   - *With*, for example, sand with silt, silt with sand, etc. if estimated to constitute less than 25% of the sediment
   - *Trace*, if estimated less than 5% of the sediment (and not included in the total 100%).

2. For other features observed, such as organics or debris, additional descriptive terms may include:

   - *Mostly*, if estimated to comprise 50% or more of the unit
   - *Some*, if estimated to comprise more than 25% to 50% of the unit
   - *Little*, if estimated to be 25% of the unit or less
   - *Trace*, if estimated less than 5% (and not included in the total 100%).

3. Consistency will be described using the following terms:

   - Density: *loose*, if easily penetrated with a sampling spoon, or *dense*, if penetration is more difficult.
   - Consistency: *very soft*, if present as an ooze that holds no shape
soft, if saggy
stiff, if it holds a shape
very stiff, if penetration with a spoon is low
hard, if no penetration with a spoon is possible.

4. Other observations (e.g., obvious anthropogenic material, dramatic color changes) may also be used to define or help define sample intervals.

The boundaries of lithologic units will be determined primarily by changes in the top two dominant grain sizes estimated visually (e.g., a change from a silty sand to a gravelly sand or to a sandy silt).

With the exception of subsampling for volatile organics (i.e.,VOCs and TPH-G), the cores will be photographed after being described and before any sediment is removed for processing. It is important for each core section to be photographed with adequate lighting from a standard measured distance from the core. Digital photographs will be used later in the production of digital core logs.

Sediment subsampling methods for Round 2A subsurface cores will follow the approach described in Section 2.2.2. Subsampled sediment will be placed into a decontaminated stainless-steel bowl. Adequate volumes of sediment will be collected for all required analyses (see Table 4-1).

Except for sample volumes collected for volatile analytes, sediment from each subsample will be individually mixed in the decontaminated, stainless-steel bowl to a uniform color and texture using a decontaminated, stainless-steel spoon. The sediment will be stirred periodically while individual samples are taken to ensure that the mixture remains homogeneous. Care will be taken to not include sediment that is in direct contact with the aluminum tube. In addition, the cutting of the aluminum tube can introduce metal shavings to the core sediment;care will be taken to avoid mixing these shavings into the homogenate. Pre-labeled jars for chemical testing will be filled with the homogenized sediment.

The types and number of field QC samples for subsurface sediment samples will follow the same guidelines prescribed for surface sediment samples. If additional volumes of sediment are required to perform all analyses in addition to QC analyses, an additional core may need to be collected from the same location and subsampled and homogenized accordingly.

Sample handling and storage procedures will follow those described for surface sediment samples in Section 4.6.2 with the following exception. When required, sediment subsamples for volatile organics will be collected from within appropriate intervals following the opening of the core and designation of the lithologic units. This process will minimize the release of volatile organics caused by mixing. Rinsate blanks will be performed at the same frequency (5%) as performed for the surface sediment sampling program.

4.6.4 Subsurface Sediment Sample Field Screening

In addition to visual observation, headspace screening using a photoionization detector (PID) and/or flame ionization detector (FID) may be used on all sample intervals to aid in the selection of samples to be analyzed.

Headspace Screening

Headspace screening involves the semi-quantitative measurement of total volatile compounds in the air above the sample material. Headspace concentrations will be measured using the following steps.

1. A small representative sample will be collected from each sample interval to be screened using a decontaminated sampling spoon. The material will be placed in a resealable plastic bag or glass jar with a septum lid.

2. The bag or jar will be tightly sealed (the jar with aluminum foil and plastic lid with septum opening), and the material will be allowed to warm at least to the ambient temperature (>32^{o} F). The sample will be allowed to sit for at least 10 to no more than 60 minutes to allow headspace concentrations to develop, and shaken periodically for at least 30 seconds at the beginning and end of the development period.

3. The PID/FID probe tip will be inserted into the container within the headspace, with care taken to avoid taking sediment or moisture into the probe.

4. The highest reading (excluding possible erratic readings) on the meter will be recorded for the sample.

5. The deepest sample interval showing a response during headspace screening will be submitted in the initial round of analyses.

4.7 WASTE DISPOSAL

Any excess water or sediment remaining after processing will be returned to the river in the vicinity of the collection site. Any water or sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site before proceeding to the next station.

All disposable materials used in sample processing, such as paper towels and disposable coveralls and gloves, will be placed in heavyweight garbage bags or other appropriate containers. Disposable supplies will be removed from the site by sampling personnel and placed in a normal refuse container for disposal at a solid waste landfill. Phosphate-free, detergent-bearing, liquid wastes from decontamination of the sampling equipment will be washed overboard or disposed of into the sanitary sewer system. Waste solvent rinses will be held in sealed plastic buckets and disposed of into the sanitary sewer. Oily or other obviously contaminated investigation-derived waste will be placed in appropriate containers, and a waste determination will be made before it is disposed of at an appropriate facility.

4.8 SAMPLE HANDLING AND TRANSPORT

Since samples collected in support of CERCLA activities may be used in litigation, their possession must be traceable from the time of sample collection through laboratory and data analysis to introduction as evidence. To ensure samples are traceable, the following procedures will be followed.

4.8.1 Chain-Of-Custody Procedures

Samples are in custody if they are in the custodian's view, stored in a secure place with restricted access, or placed in a container secured with custody seals. A chain-of-custody record will be signed by each person who has custody of the samples and will accompany the samples at all times. Copies of the chain-of-custody will be included in laboratory and QA/QC reports.

An example chain-of-custody form is provided in Appendix D. At minimum, the form will include the following information:

- Site name
- Field task leader's name and team members responsible for collection of the listed samples
- Collection date and time of each sample
- Sampling type (e.g., composite or grab)
- Sampling station location
- Number of sample containers shipped
- Requested analysis
- Sample preservation information
- Name of the carrier relinquishing the samples to the transporter, noting date and time of transfer and the designated sample custodian at the receiving facility.

The field task leader, as the designated field sample custodian, will be responsible for all sample tracking and chain-of-custody procedures for samples in the field. The sample custodian will be responsible for final sample inventory and will maintain sample custody documentation. The custodian will complete chain-of-custody forms prior to removing samples from the sampling vessel. Upon transferring samples to the laboratory sample custodian, the field task leader will sign, date, and note the time of transfer on the chain-of-custody form.

The original chain-of-custody form will be transported with the samples to the laboratory. Each laboratory will also designate a sample custodian, who will be responsible for receiving samples and documenting their progress through the laboratory analytical process. Each custodian will ensure that the chain-of-custody and sample tracking forms are properly completed, signed, and initialed upon transfer of the samples.

Chemistry samples will be shipped to the laboratory in ice chests sealed with custody seals. Each ice chest will have three seals, one on the front of the chest and one on each side. The laboratory sample custodian will establish the integrity of the seals at the laboratory.

Upon receipt of the samples at the laboratory, the laboratory sample custodian will inventory the samples by comparing sample labels to those on the chain-of-custody document. The custodian will enter the sample number into a laboratory tracking system by project code and sample designation. The custodian will assign a unique laboratory number to each sample and will be responsible for distributing the samples to the appropriate analyst or for storing samples in an appropriate secure area. Specific laboratory chain-of-custody procedures are described in the laboratory QA plans for each of the designated labs (Integral and Windward 2004).

4.8.2 Sample Shipping

The analytical laboratories will supply sample coolers and packing materials. Upon completion of final inventory by the field sample custodian, individual sample containers will be placed into a sealed plastic bag. Samples will then be packed in a cooler lined with a large plastic bag. Glass jars will be packed to prevent breakage and separated in the shipping container by bubble wrap or other shock-absorbent material. Ice in sealed plastic bags or “blue ice” will then be placed in the cooler to maintain a temperature of approximately 4ºC.

When the ice chest is full, the chain-of-custody form will be placed into a zip-locked bag and taped on the inside lid of the cooler. A temperature blank will be added to each cooler and a trip blank will be added to each cooler with samples for volatile analyses (VOCs and gasoline). Each ice chest will be sealed with three chain-of-custody seals. On each side of the cooler a *This End Up* arrow label will be attached; a *Fragile* label will be attached to the top of the cooler. Coolers will be transported to the laboratory by courier or overnight shipping service. These packaging and shipping procedures are in accordance with U.S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24.

The coolers will be clearly labeled with sufficient information (i.e., name of project, time and date container was sealed, person sealing the cooler, and company name and address) to enable positive identification.

4.9 QUALITY CONTROL PROCEDURES

Quality control requirements will be instituted during sampling, laboratory analysis, and data management to ensure that the data quality objectives are met. Detailed information on QA/QC procedures, limits, and reporting are described in detail in the QAPP (Integral and Windward 2004). Field QC requirements are described in the following sections. If quality control problems are encountered, they will be brought to the attention of the CERCLA Project Coordinator. Corrective actions, if appropriate, will be implemented to meet the project's data quality objectives.

4.9.1 Field QC Samples

Field QC samples are used to assess within-station variability (e.g., replicates), evaluate the effectiveness of sample homogenization and within-sample variability (e.g., splits), evaluate potential sources of sample contamination (e.g., rinsate and trip blanks), or confirm proper storage conditions (e.g., temperature blanks). The types of QC samples that will be collected in Round 2 are described in this section and summarized in Table 4-2. The estimated numbers of field and QC samples are listed in Table 4-3.

Replicate Samples

Field replicates are additional samples collected at a station to enable statistical analysis of the resulting data. Their origin is not revealed to the laboratory (also called a “blind” replicate in Table 4-2). Field replicates will be generated by collecting new sediment or water at the sampling location, not by subsampling composited samples. These data will be used to determine natural variability associated with the environment and laboratory operations.

Duplicate samples will be collected at approximately 5% of the sediment sampling stations. All replicates will be submitted to the laboratory blind.

Other Field QC Samples

Blind field splits will also be generated for sediment samples at half of the stations where blind field replicates are collected (2.5% of the total stations). Split samples are multiple samples taken from a single sample composite after it is fully homogenized. Split samples will be generated at 2.5% of the sample locations and will be provided to EPA for independent laboratory analysis, as requested. The resulting data will provide information on the variability associated with sample handling and laboratory analysis operations.

Introduction of chemical contaminants during sampling and analytical activities will be assessed by the analysis of blanks. Rinsate blanks, consisting of sampling equipment rinsates, will be generated for all chemical parameter groups at approximately 5% of the sediment sampling stations and submitted for analysis to the laboratory.

The blind field sample splits, blind field replicates, and rinsate blanks will be collected at the same stations, thus maximizing the amount of information available to distinguish laboratory and environmental variability.

Temperature blanks are used to measure and ensure cooler temperature upon receipt to the laboratory. One temperature blank will be prepared and submitted with each cooler shipped to the analytical laboratory. The temperature blank will consist of a sample jar containing deionized water that will be packed into the cooler in the same manner as the rest of the samples and labeled "temp blank."

Field trip blanks are used to determine if volatile chemicals are introduced to samples during holding or storage prior to analysis. One trip blank will be included with each cooler containing samples for analysis of volatile organic compounds. The field trip blanks will consist of deionized water sealed in a sample container by the analytical laboratory. The trip blank will be generated and transported to and from the field and then returned to the laboratory unopened for analysis.

4.9.2 Performance Audits

The Field QA Manager will conduct field performance audits at least once during each field program. The audits will involve assessing the sample collection and processing procedures relative to the procedures described in this FSP and to standard collection procedures. Data recording procedures will be reviewed for completeness.

4.9.3 Corrective Actions

Results of the field performance audit may identify the need for corrective actions. The Field QA Manager will immediately institute the necessary corrective actions, complete a corrective action form (see Appendix D), and conduct an additional audit to ensure that the correct procedures continue to be followed.

If corrective actions require a departure from the FSP, these changes will be documented on a field change request form (see Appendix D). In any other circumstances where sampling conditions are unexpected, the appropriate sampling actions consistent with project objectives will be conducted after the Field QA Manager informs the Sampling and Analysis Coordinator. This change will be noted in the field log, and a change request form will be completed for the project files.

5.0 LABORATORY ANALYSIS

This section summarizes the physical, chemical, and biological analyses performed for the characterization of sediment samples in Round 2. The required analyses for each sample that will be collected in Round 2 are summarized in Table 2-1 and listed individually in Tables 2-2 and 2-3. Details regarding laboratory methodology will be provided in the Round 2 QAPP.

5.1 PHYSICAL AND CHEMICAL ANALYSES

Analytes, project-specific reporting limits, and analytical methods for sediments are listed in Table 5-1. For most of the sediment samples, the standard chemical suite will be analyzed, including metals, SVOCs, pesticides, and PCB Aroclors. TPH, butyltins, VOCs, dioxins and furans, chlorinated herbicides, hexavalent chromium, ammonia, and sulfides will be analyzed at selected stations. The conventional parameters, grain size, total solids, TOC, and specific gravity, will be analyzed at all stations, and total sulfides and ammonia will be analyzed in all surface sediments subjected to bioassay testing. Specific gravity and grain size will be analyzed in all physical CSM samples. Samples for Atterberg limits analysis will also be collected at all stations, and then 10% of the samples will be selected for analysis. A registered geotechnical engineer or geologist will select appropriate samples for Atterberg analysis based on sample descriptions. The intent will be to obtain a representative number and distribution of samples for this analysis.

Analytical methods and QC measurements and criteria are based on current Contract Laboratory Program (CLP) and SW-846 requirements, and EPA guidance. Detailed laboratory methods, QA procedures, and QA/QC requirements are described in the Round 2 QAPP (Integral and Windward 2004).

All samples will be maintained according to the appropriate holding times and temperatures for each analysis, as summarized in Table 4-1. Field QC sample requirements are described in Section 4.9 and summarized in Table 4-2. A temperature blank will be included in each cooler.

Laboratory QA will be implemented as described in the Round 2 QAPP and according to each of the identified laboratories' respective QA programs, plans, and SOPs. Additional information on analytical methods and laboratory QA program plans for each laboratory is provided in the QAPP.

5.2 BIOASSAY TESTING

Two sediment toxicity tests will be conducted:

- Chronic 28-day freshwater water amphipod (*Hyalella azteca*)

- Chronic 10-day freshwater midge (*Chironomus tentans*).

5.2.1 Amphipod Bioassay

The purpose of this test is to characterize the chronic toxicity of freshwater sediments using a 28-day exposure and survival and growth endpoints with the amphipod, *Hyalella azteca*. This protocol is based on ASTM Method E 1706-00 (ASTM 2003) and EPA Method 100.4 (EPA 2000). Test responses will be compared to the responses observed in the negative controls. Determination of the “hit/no hit” designation of each sediment sample will be based on a statistical comparison with the negative control. The toxicity of the sediments will be assessed using the benthic approach as presented in the *“Estimating Risks to Benthic Organisms using Sediment Toxicity Tests”* technical memorandum.

5.2.2 Midge Bioassay

The purpose of this test is to characterize the toxicity of freshwater sediments using a 10-day exposure survival and growth endpoints with the midge, *Chironomus tentans*. This protocol is based on EPA Method 100.2 (EPA 2000) and ASTM Method E 1706-00 (ASTM 2003). Test responses will be compared to the responses observed in the negative controls. Determination of the “hit/no hit” designation of each sediment sample will be based on a statistical comparison with the negative control. The toxicity of the sediments will be assessed using the benthic approach as presented in the *“Estimating Risks to Benthic Organisms using Sediment Toxicity Tests”* technical memorandum.

Additional information on bioassay test methods and laboratory QA program plans is provided in the QAPP.

6.0 FIELD DATA MANAGEMENT PLAN

During field operations, effective data management is the key to providing consistent, accurate, and defensible documentation of data quality. Field data will include descriptive and geographical information associated with sediment and water collection.

A detailed data management plan is provided as an appendix to the Work Plan (Integral et al. 2004). Daily field records (a combination of field logbooks and field data sheets) and navigational records will make up the main documentation for field activities. The plan components most applicable to field activities are summarized in the following sections.

6.1 FIELD LOGBOOKS

All field activities and observations will be noted in field logbooks during the fieldwork. The procedures and requirements for logbook entries are detailed in Section 4.3.

6.2 FIELD DATA SHEETS

Field data sheets and sample description forms will be completed for all samples and kept in the project file as a permanent record of the sampling or field measurement activities. Information such as habitat descriptions, sediment, water, and biota sampling data will be noted on the field data sheets. Depending on the activity, the type of field data sheet and the information recorded on it may vary. A reference date and activity will be entered into the logbook to refer to the field data sheets being generated. If field data sheet entries are entered in an electronic format, each sheet will indicate who completed the data entry and when. The field task leader is responsible for ensuring that all field data sheets are correct and that they become part of the permanent file.

6.3 FIELD DATA MANAGEMENT

As soon after collection as possible, field notes and data sheets will be scanned to create an electronic record for use in creating the cruise report. Field data will be hand-entered into the database. Twenty percent of the transferred data will be verified based on hard copy records. Electronic QA checks to identify anomalous values will also be conducted following entry.

6.4 SAMPLE IDENTIFICATION

Station location identification numbers for each target location are listed in Tables 2-2 (surface samples) and 2-3 (subsurface samples). During sample collection, a unique code will be assigned to each sample as part of the data record. This code will indicate the project phase, sampling location, sample type, and level of replication/duplication.

All samples will be assigned a unique identification number based on a sample designation scheme designed to meet the needs of the field personnel, laboratory and LWG data management, validation chemists, and data users. Sample identifiers will consist of two to three components separated by dashes. The first component, LW2, identifies the data as belonging to the Lower Willamette River RI/FS, Round 2. The second component will contain a one-letter abbreviation for the sample type followed by the station number. The following abbreviations for sample types will be used:

G = grab sample
C = core sample

Additional codes may be adopted, if necessary, to reflect sampling equipment requirements. Leading zeros will be used for stations with numbers below 100 for ease of data management and correct sorting.

The third component will be used to code core intervals and field duplicate samples and splits. A single letter will be placed after the sample number for core samples to designate the sample interval. "A" will designate the top interval (e.g., 0-1 feet). All subsequent (deeper) sample intervals will be indicated in alphabetical order (e.g., "B", 1-4 feet; "C", 4-7 feet, etc.)

A single digit number will be used to indicate field duplicates or splits in the third component of the sample identifiers. For sediment cores, this number will be appended directly to the letter that indicates sample horizon for sediment cores.

For equipment decontamination blanks, sequential numbers starting at 900 will be assigned instead of station numbers. The sample type code will correspond to the sample type for which the decontamination blank was collected.

Example sample identifiers are:

LW2-G022: grab sample from Station 22
LW2-C022-A: upper interval of core from Station 22

LW2-G022-1: grab sample from Station 22
LW2-G022-2: duplicate grab sample from Station 22
LW2-G022-3: split sample from Station 22

LW2-C022-B1: second interval of core from Station 22
LW2-C022-B2: second interval of duplicate core from Station 22
LW2-C022-B3: split sample from second interval of a core from Station 22

LW2-C902: equipment blank for the sediment core samples.

6.5 CHAIN-OF-CUSTODY

The chain-of-custody record provides documentation of sample possession and handling from the time of collection until final site decisions are approved.

Chain-of-custody forms and procedures are described in Section 4.8.1.

7.0 REPORTING

Results of the Round 2 surface and subsurface sediment sampling efforts will be reported to EPA in accordance with the deliverables schedule provided in the Work Plan (Integral et al. 2004).

A Round 2A sediment field sampling report will be prepared and submitted to EPA within 60 days of completing the Round 2A field sample collection effort described in this FSP. The field sampling report will summarize field sampling activities, including sampling locations (maps), requested sample analyses, sample collection methods, and any deviations from the FSP. Similarly, a Round 2B sediment field sampling report will be prepared and submitted to EPA within 60 days of completing the Round 2B field sample collection effort described in this FSP addendum.

LWG-validated analytical laboratory data will be provided to EPA in an electronic format within 90 days of completion of each sampling event (e.g., surface sampling, 2A subsurface sampling). A sampling event will generally be considered complete when the last sample of that type described in this FSP has been collected. A bioassay data report will be provided to EPA within 60 days of receipt of the bioassay laboratory data report.

Round 2 sediment chemistry results for surface and subsurface sediments will be reported in tabular format and presented on maps in the Round 2 sediment site characterization summary report. The Round 2 benthic assessment report will be provided to EPA within 180 days following completion of Round 2 bioassay sampling. The Round 2 sediment chemistry and bioassay results also will be incorporated into the RI report and baseline risk assessments, which will be prepared after all sampling and analysis rounds for the project are completed.

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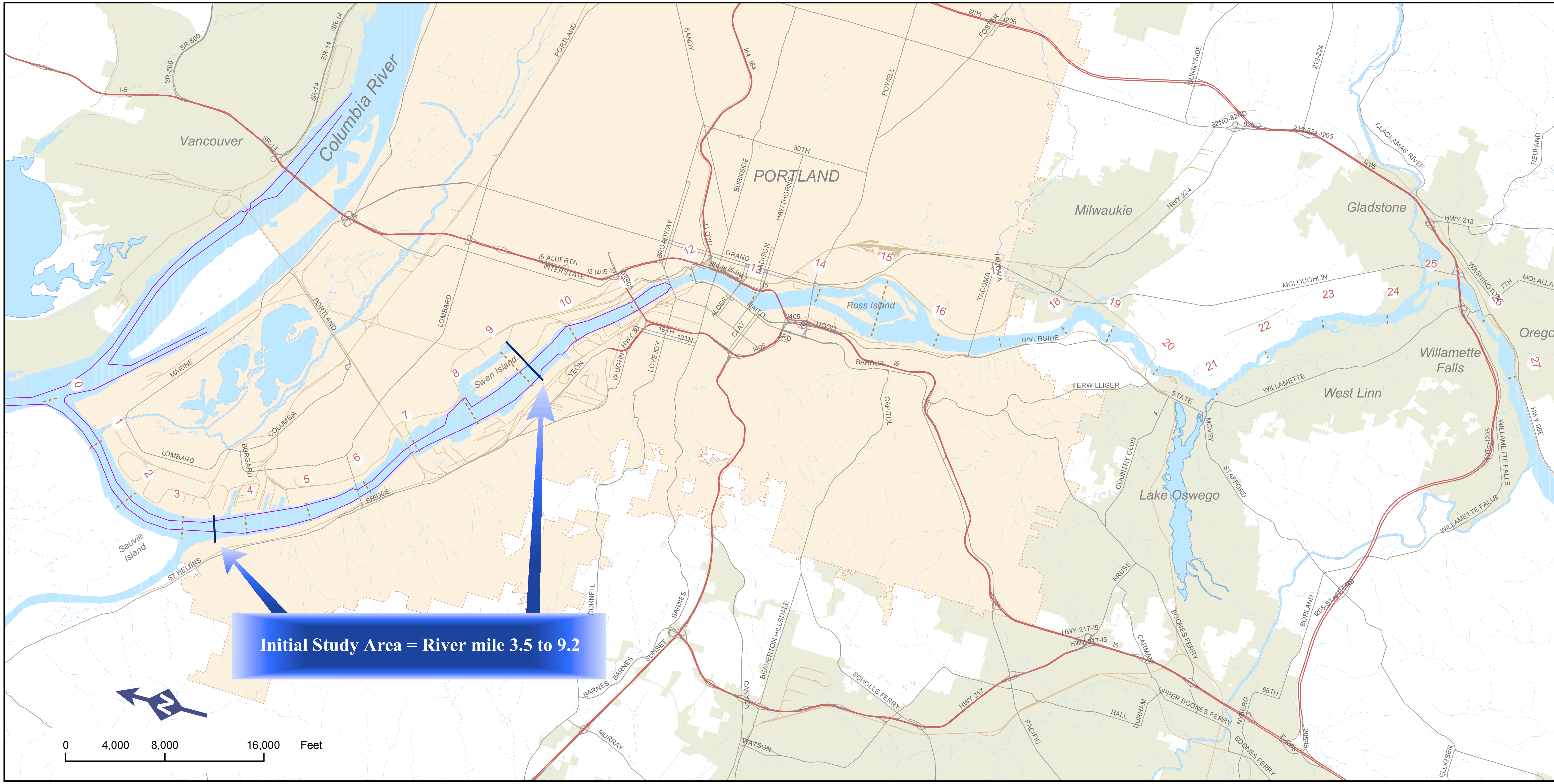


LWG LOWER WILLAMETTE GROUP

integral consulting inc.

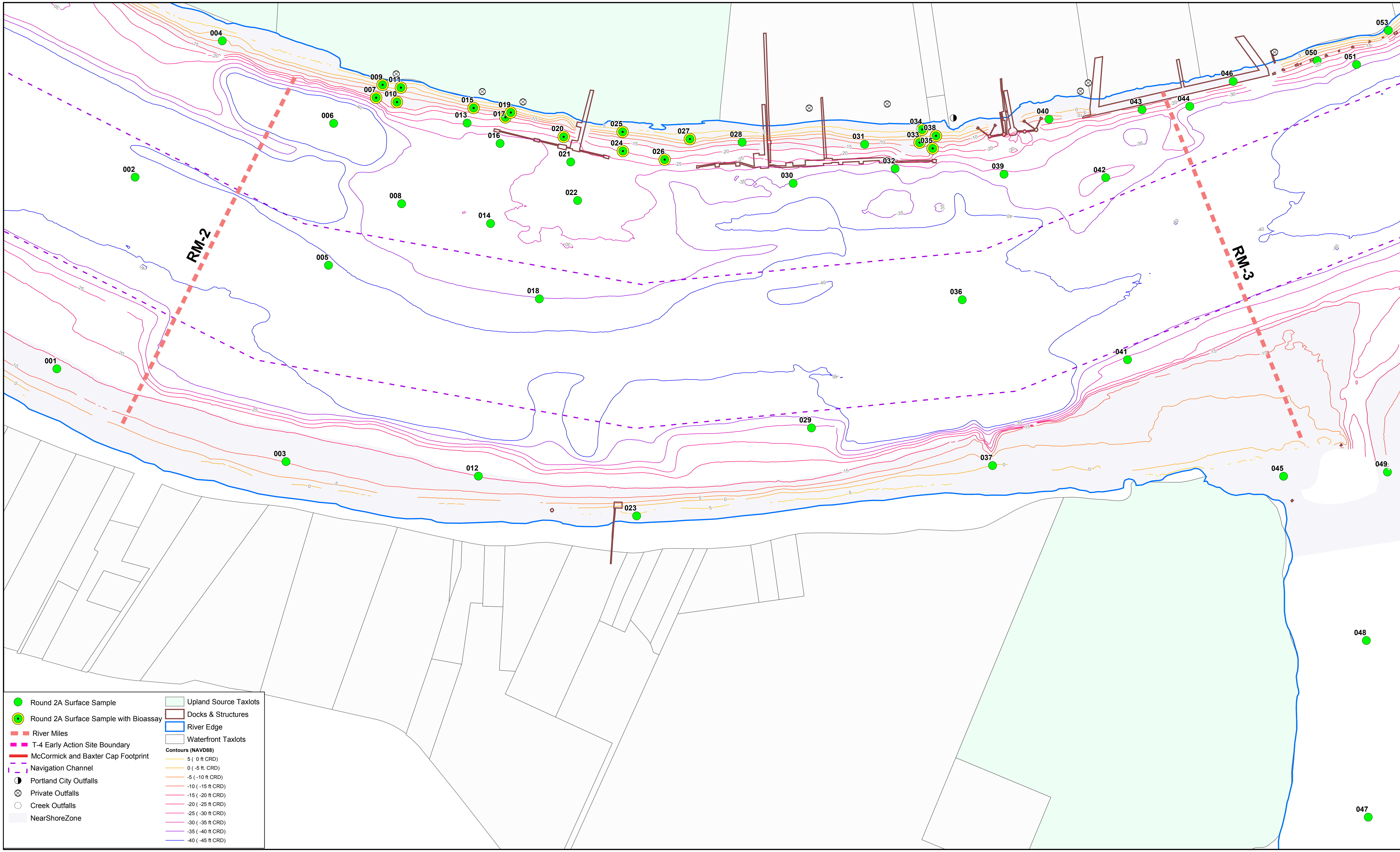
FEATURE SOURCES:
Transportation, Water, Property, Zoning or Boundaries: Metro RLIS .
Channel & River miles: Developed from US Army COE information.

File name: Site_Map_B.mxd
Plot Date: 12/16/03

LEGEND:
- Portland
- Other Cities
- Navigation Channel
- River Miles

Major Roads
- Freeways
- Major Streets

Figure 1-1
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Site Map



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LWG LOWER WILLAMETTE GROUP

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

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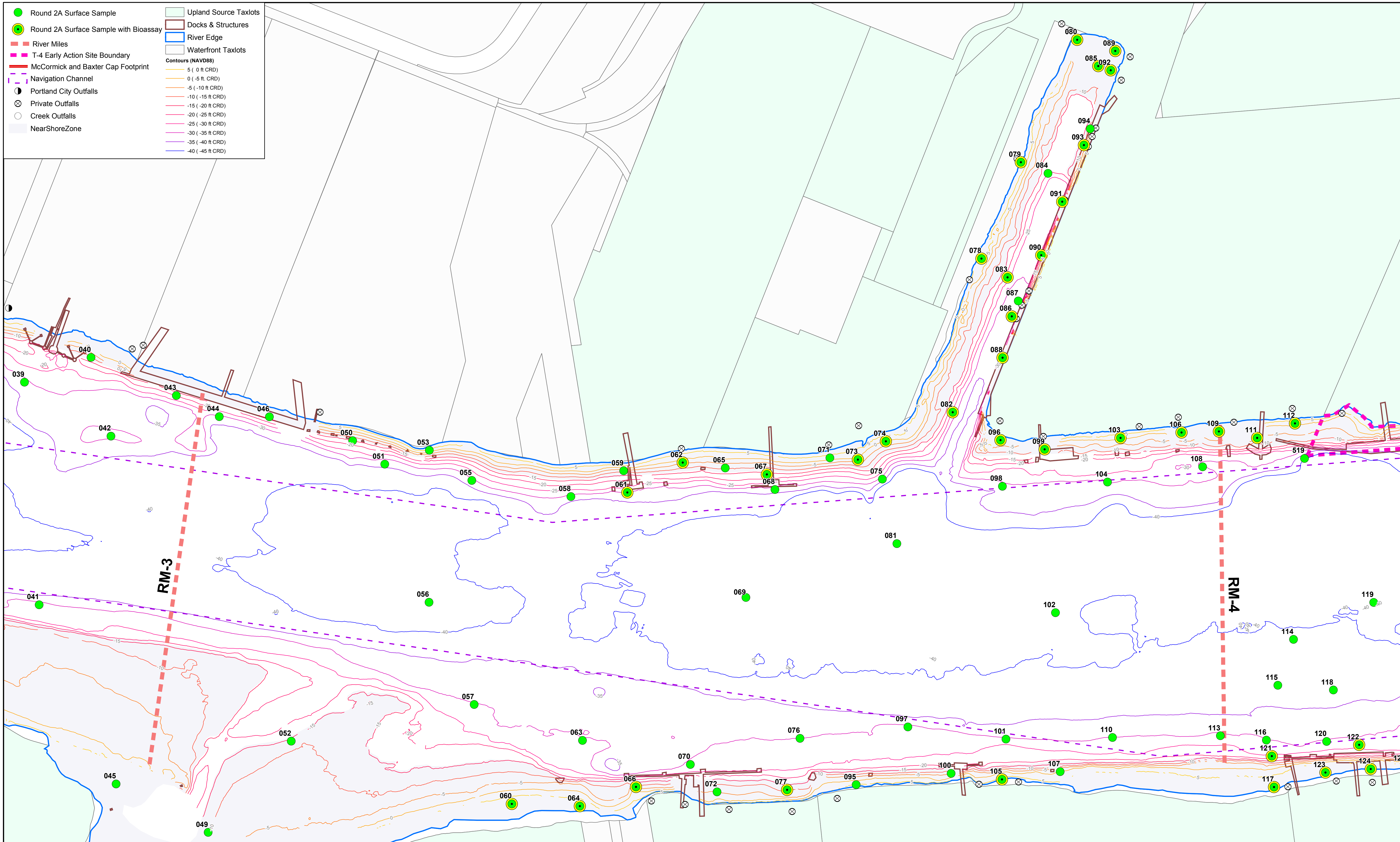
Figure 2-1a
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



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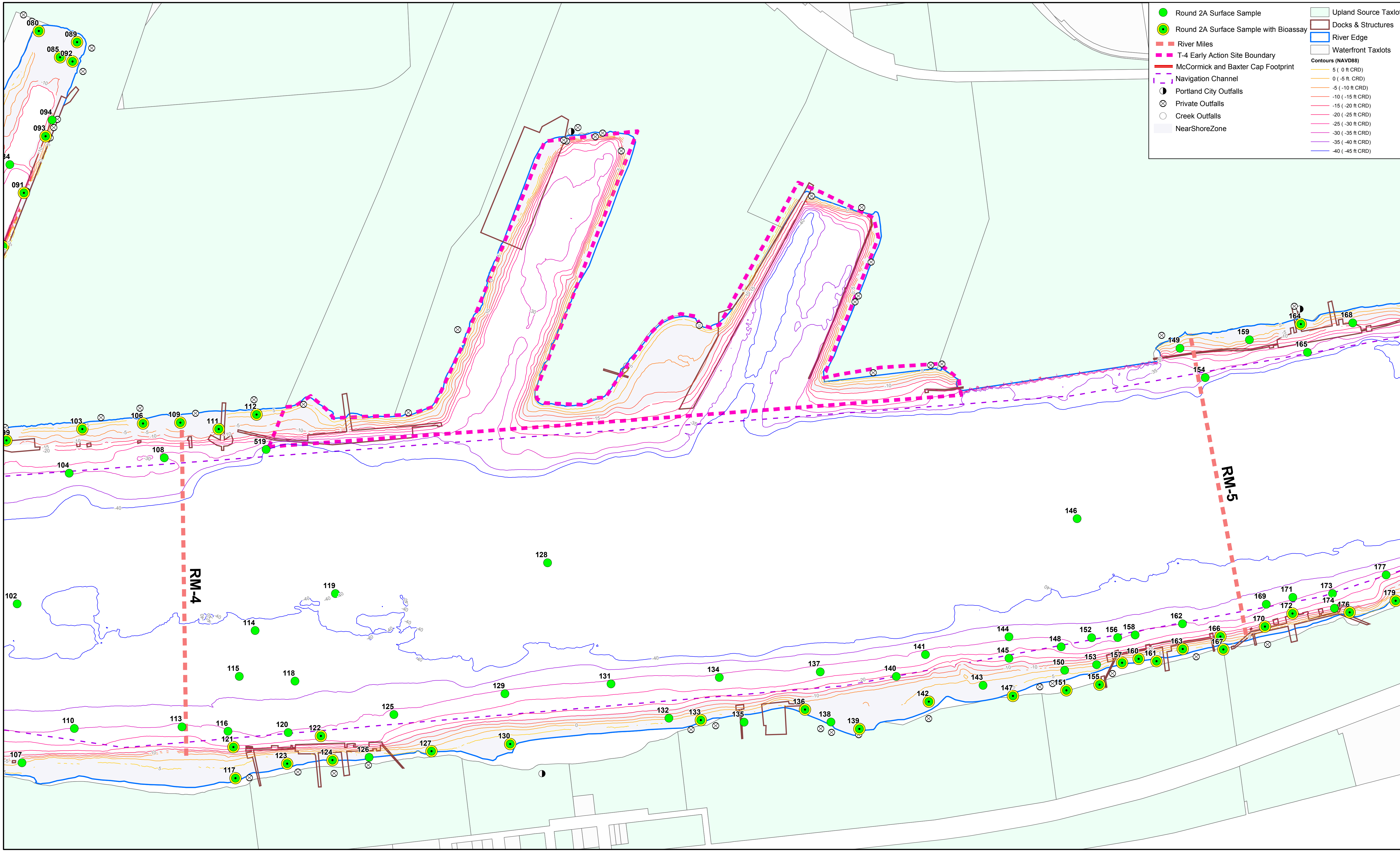
LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-1b
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



integral consulting inc.

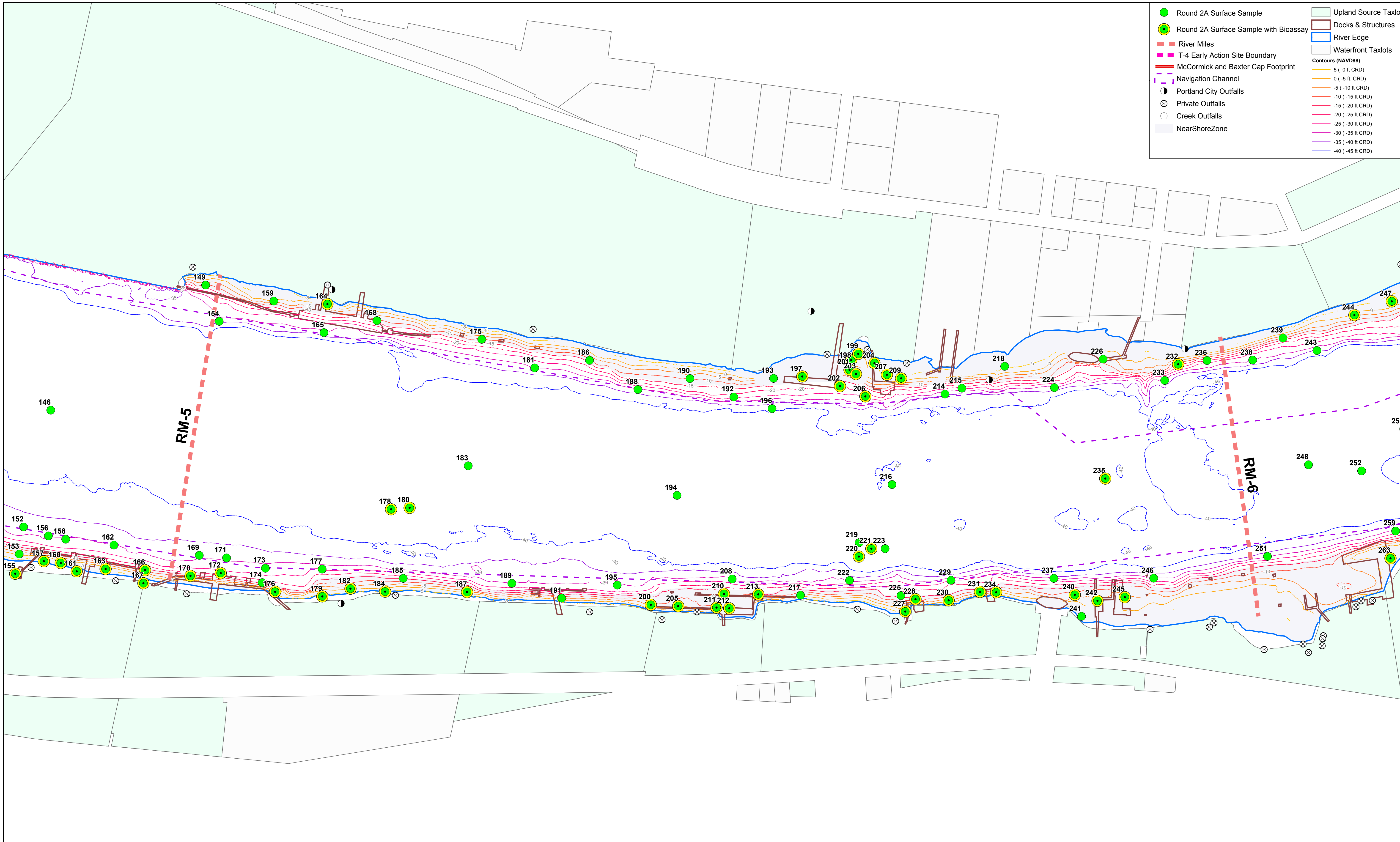
LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-1c
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



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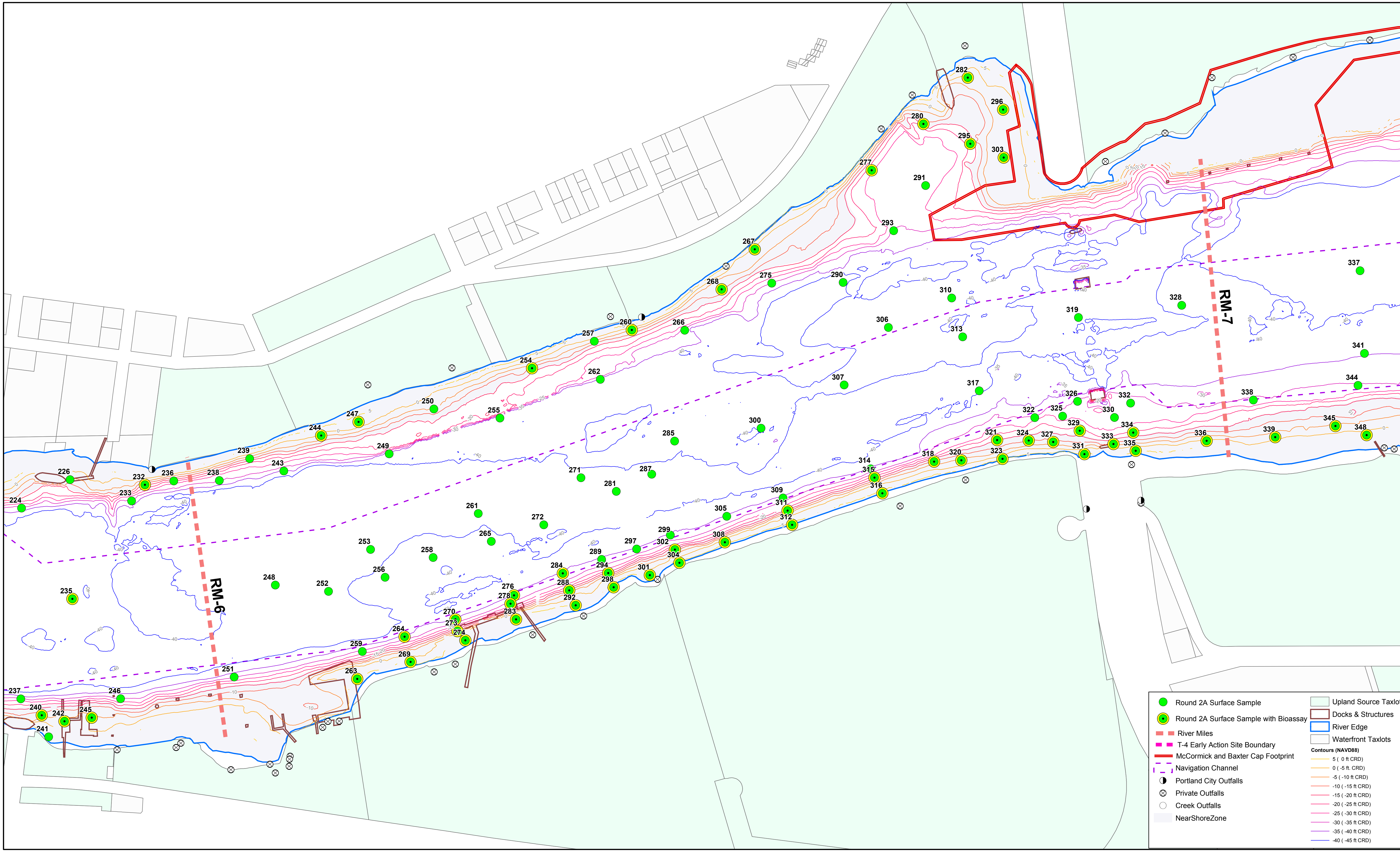
Plot Date:06-21-2004

Figure 2-1d
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



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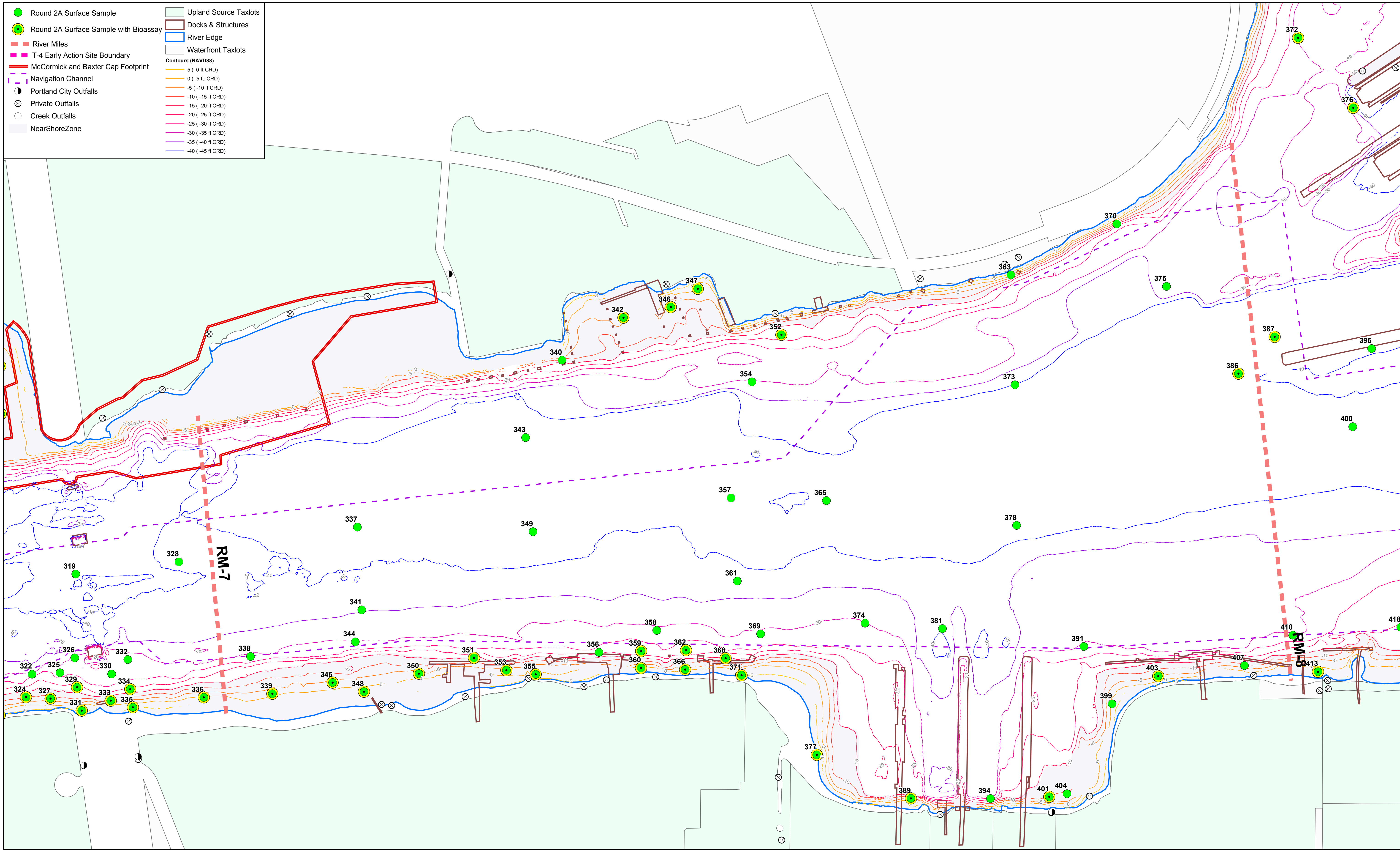
Plot Date:06-21-2004

Figure 2-1e
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



integral consulting inc.

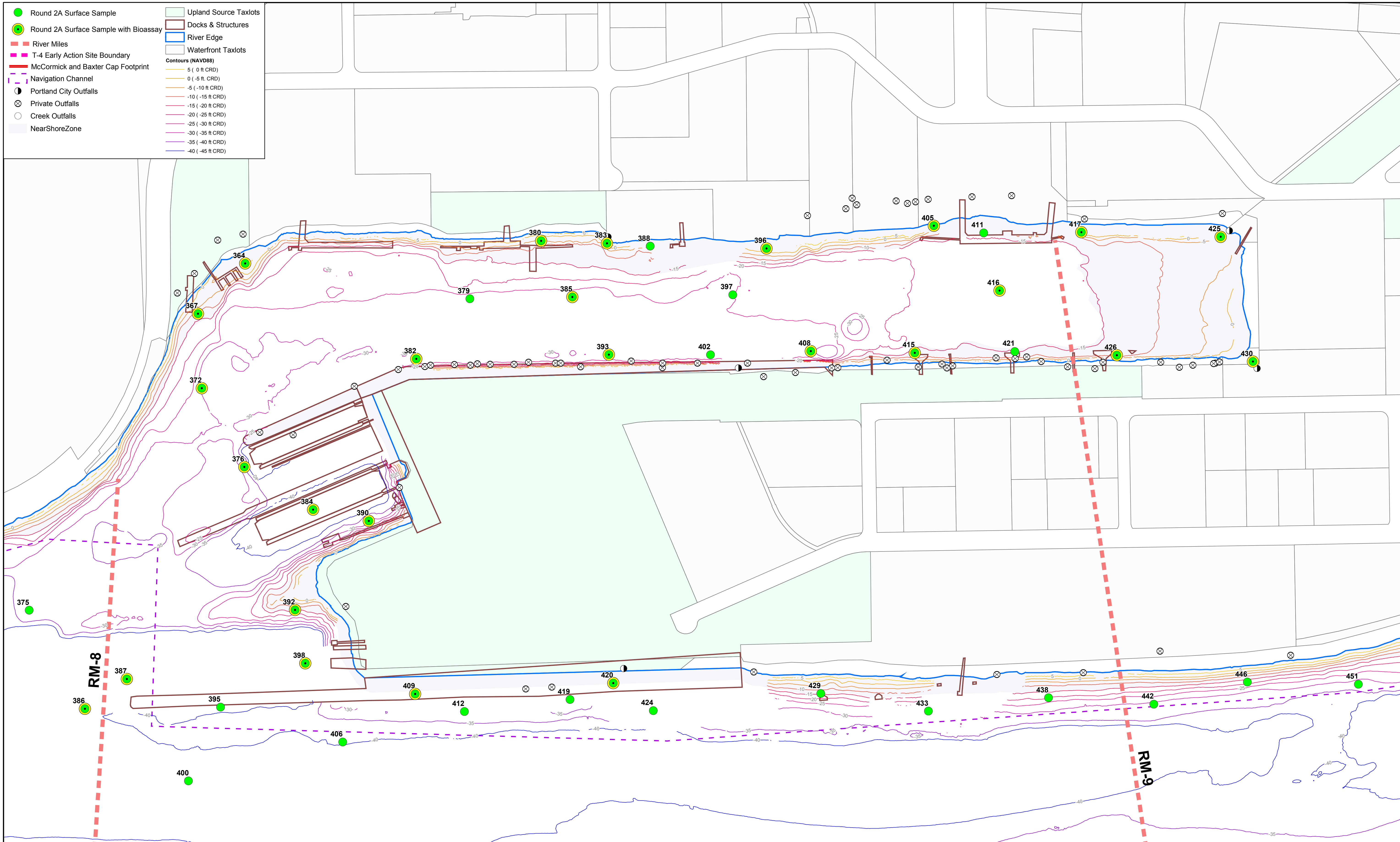
LWG LOWER WILLAMETTE GROUP

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

0 250 500 1,000 Feet

N

Figure 2-1f
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



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LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\
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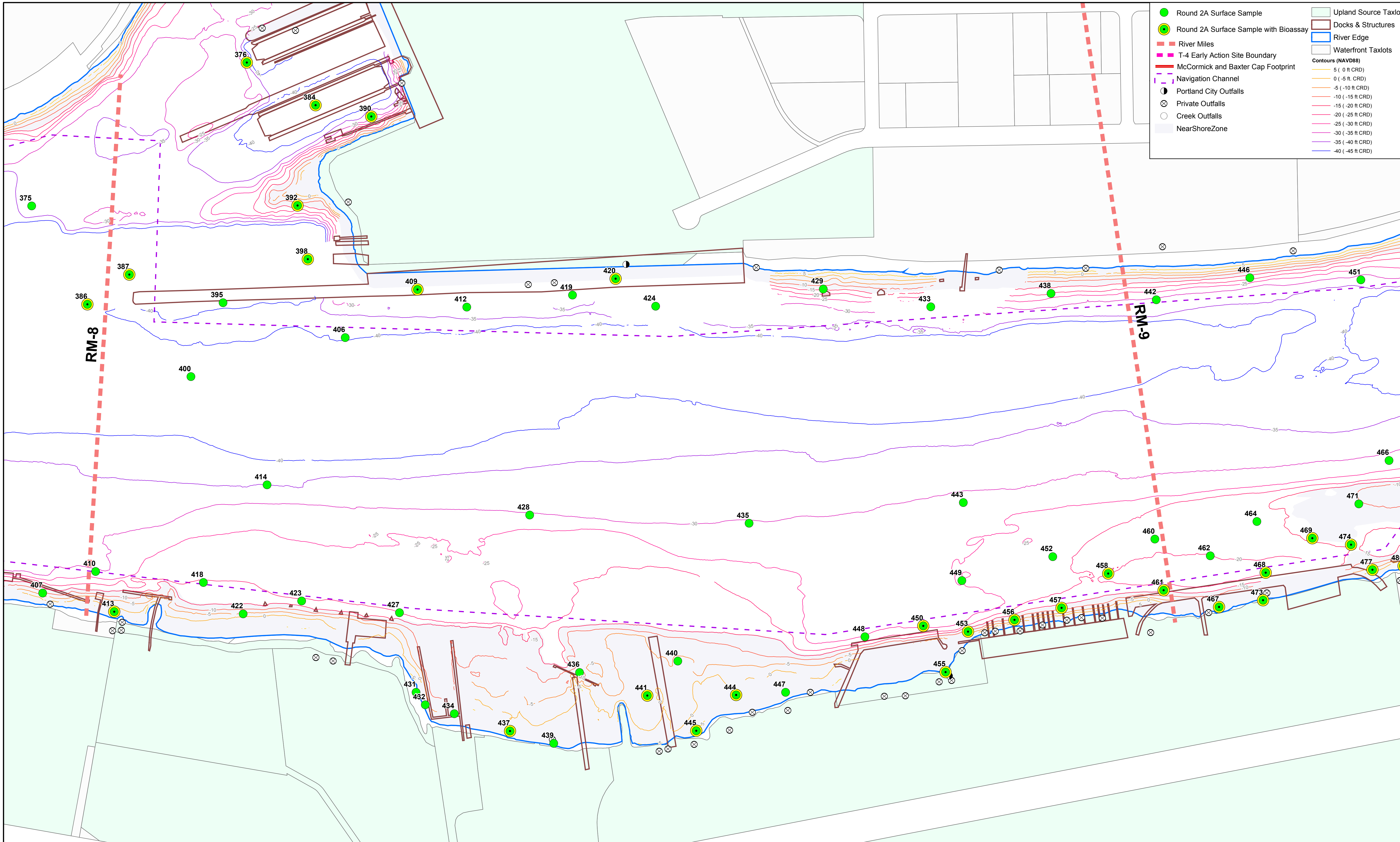
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-1g
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



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LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\
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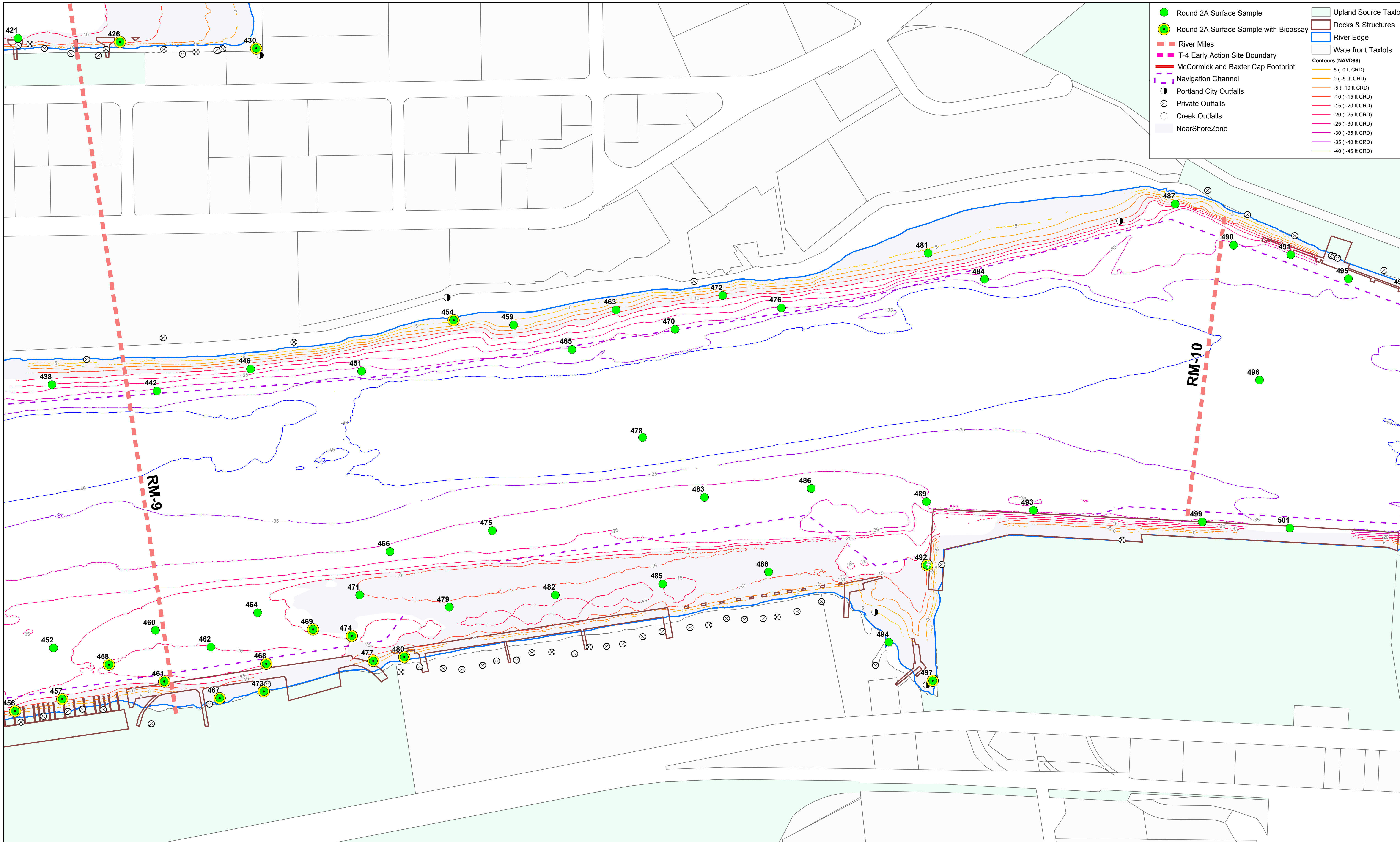
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-1h
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations



integral consulting inc.

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\ LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

Figure 2-1i
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations

Map Document: (C:\GIS\Projects\Portland_Harbor\
LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

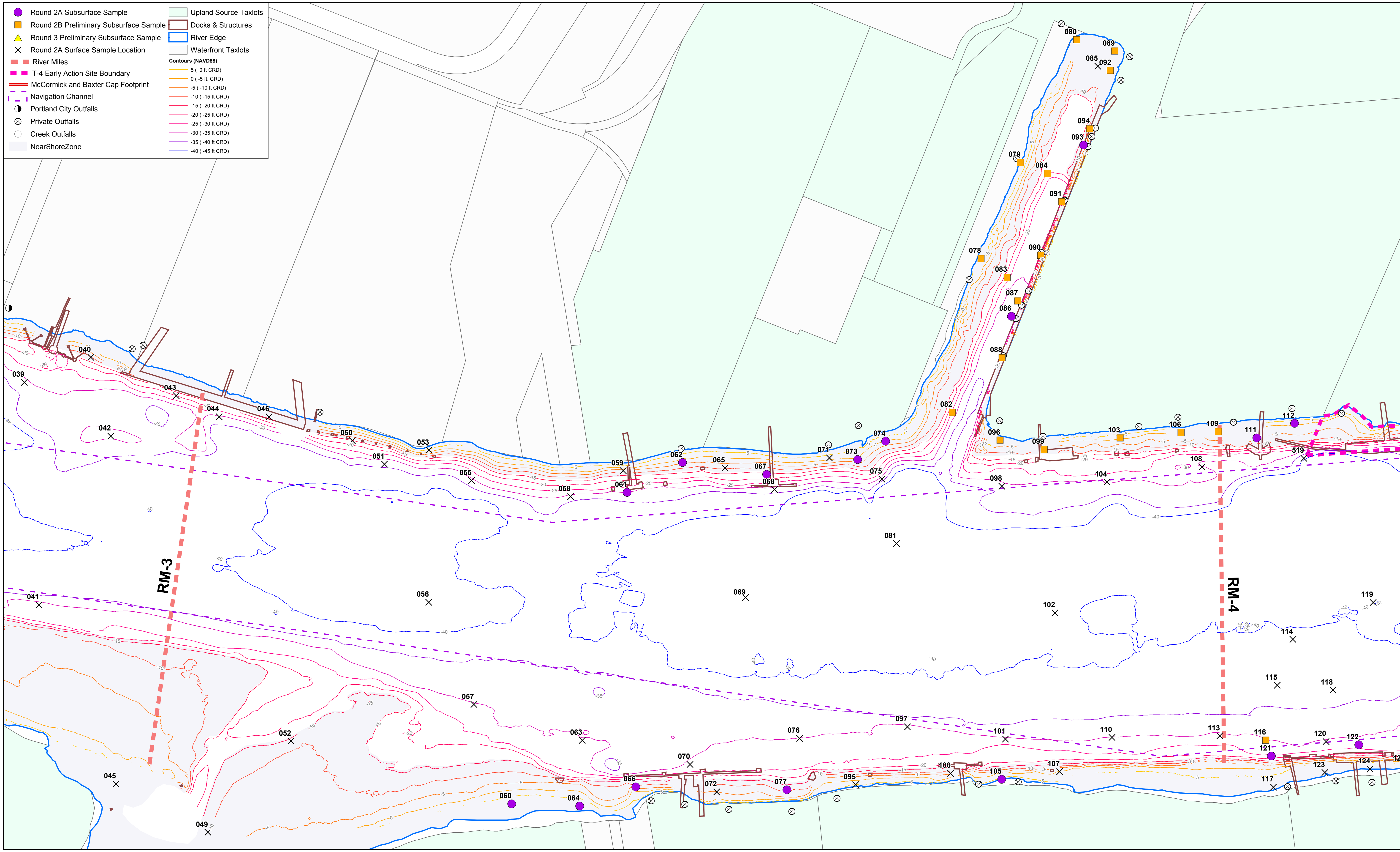
0 250 500 1,000 Feet

Figure 2-1j
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Surface Sediment and Bioassay Sampling Locations

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

0 250 500 1,000 Feet

Figure 2-2a
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations



integral consulting inc.

LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2b
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations

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LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2c
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations

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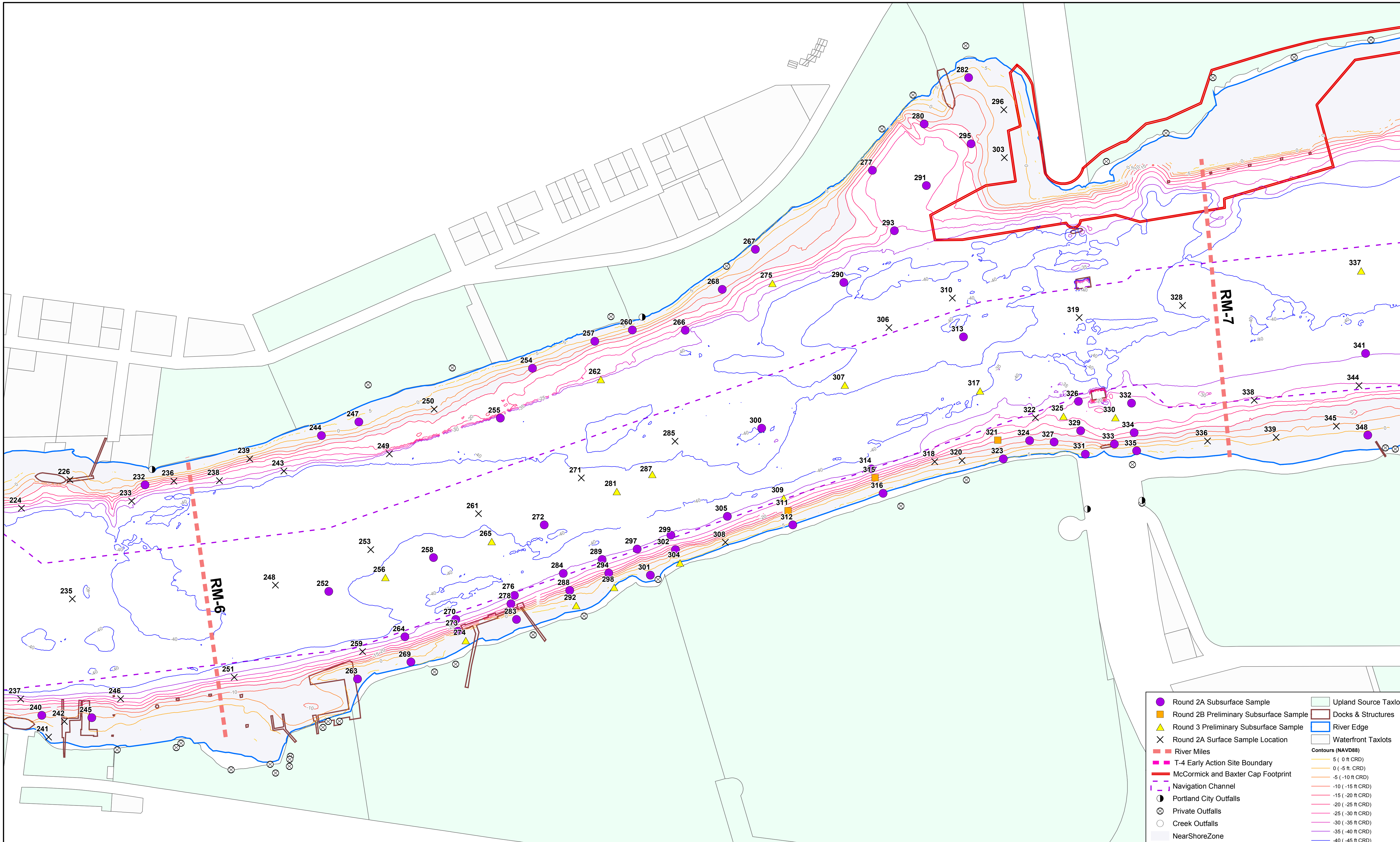
LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\
LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2d
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations



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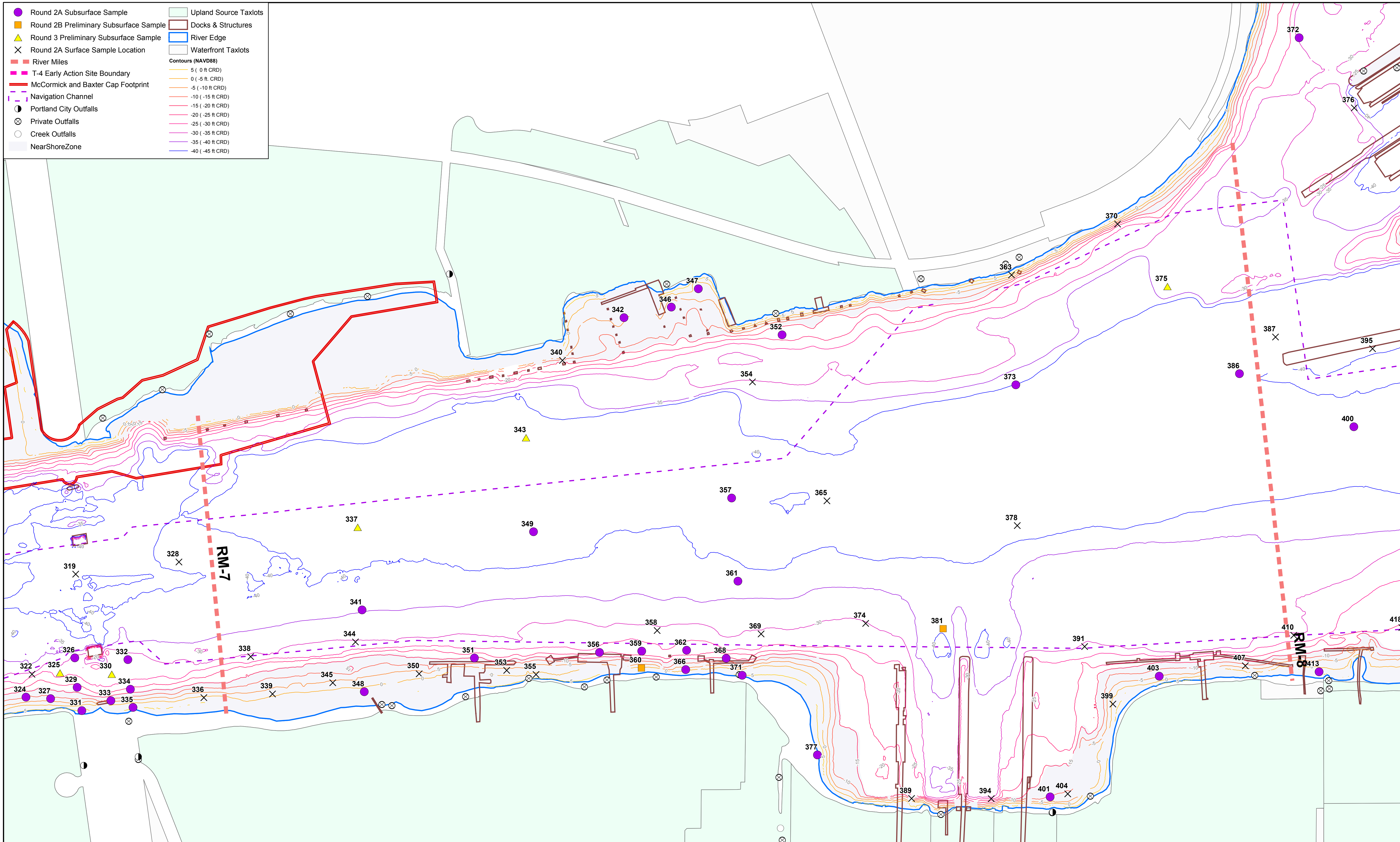
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2e
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations



integral

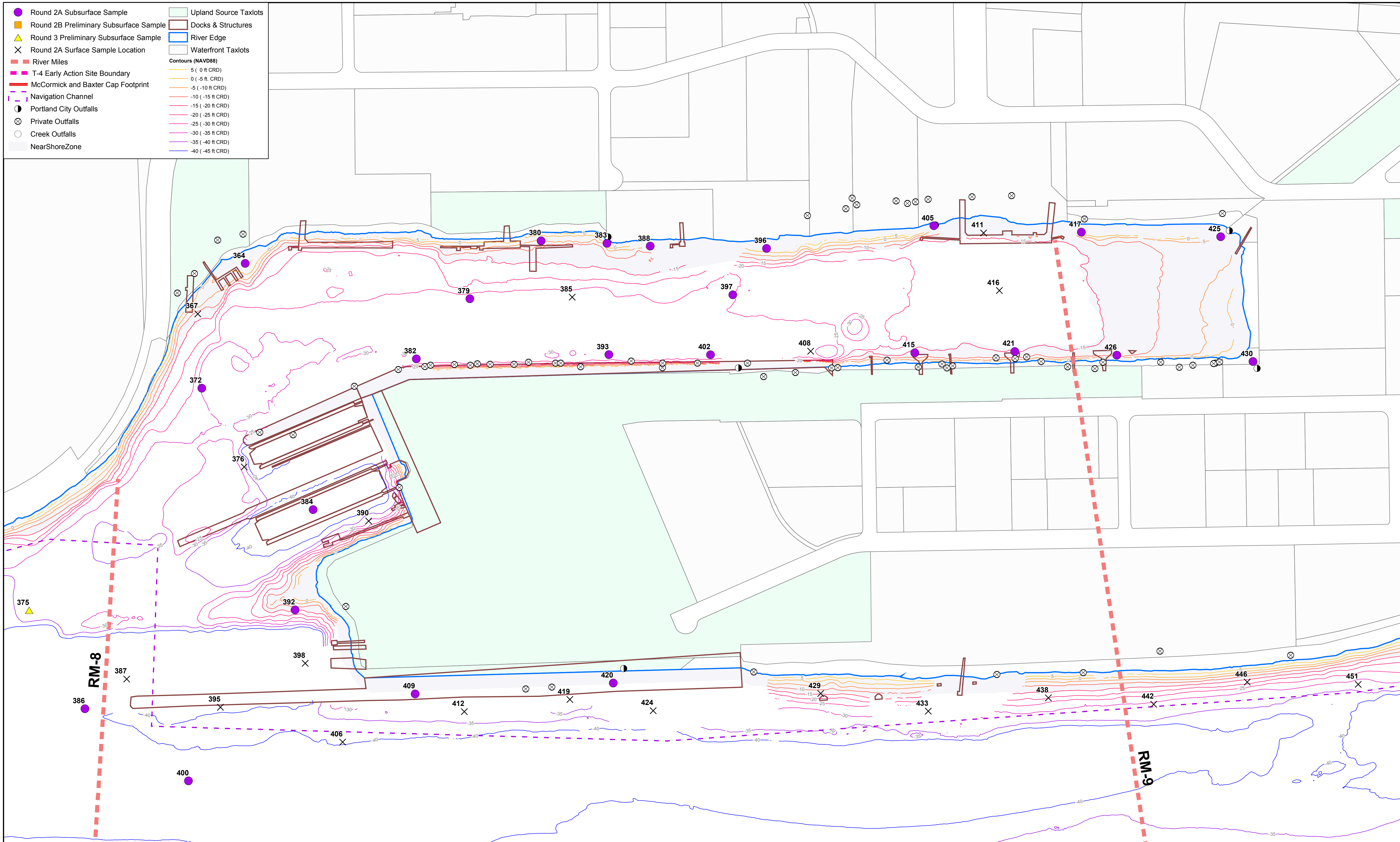
LWG LOWER WILLAMETTE GROUP

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2f
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations



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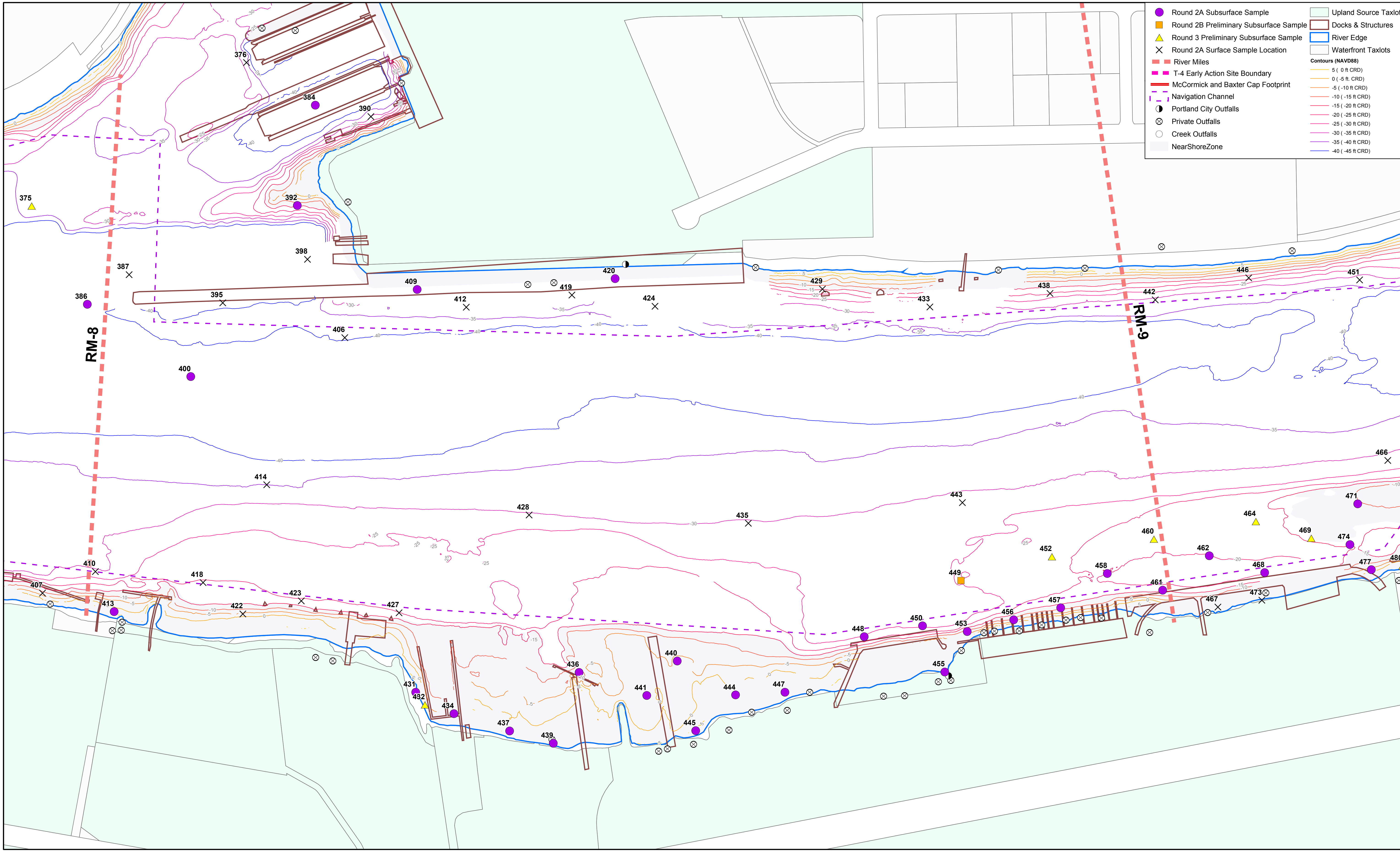
LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2g
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations



integral consulting inc.

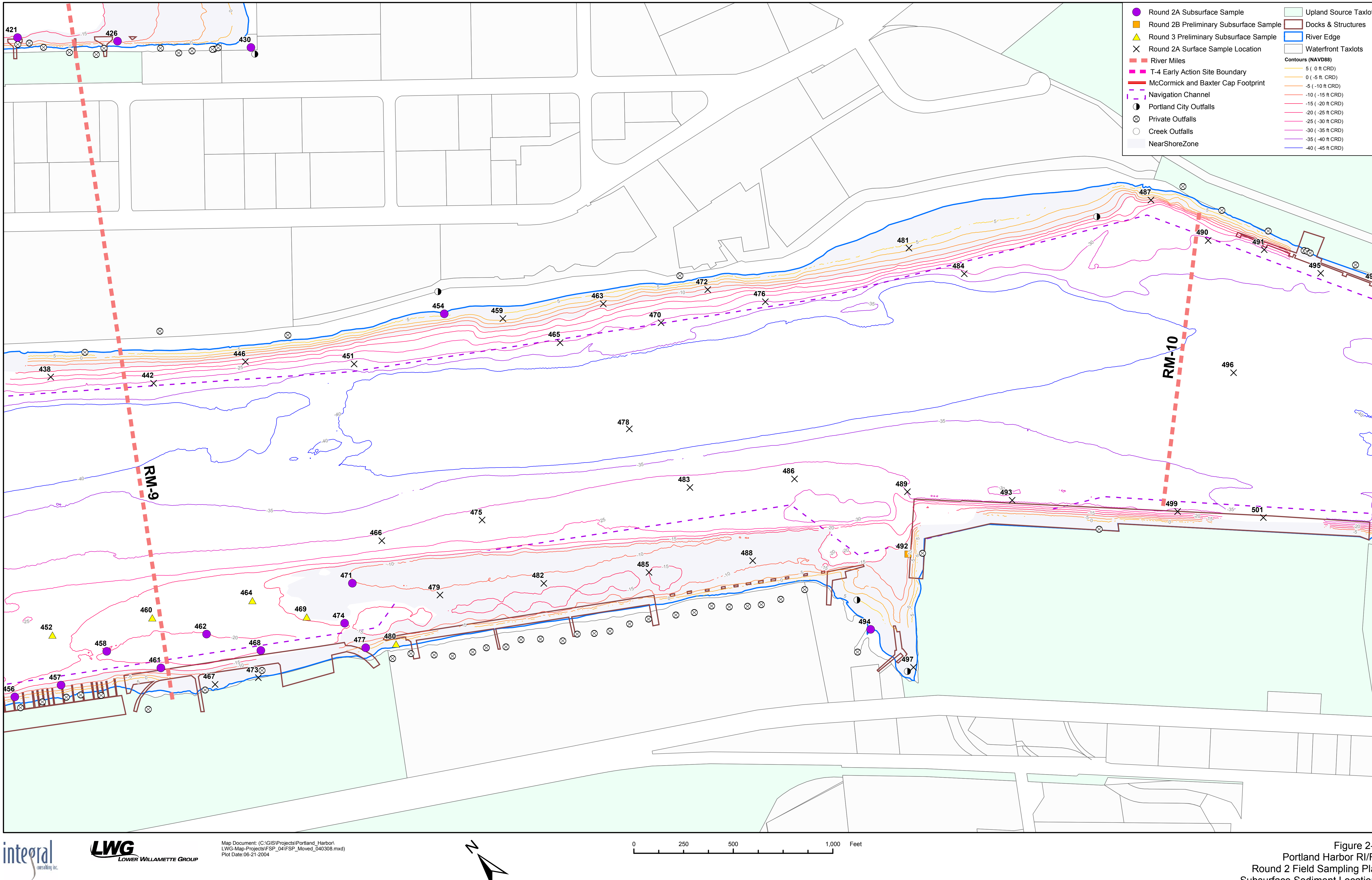
LWG Lower Willamette Group

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2h
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations



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Plot Date:06-21-2004

integral consulting inc.

LWG Lower Willamette Group

Figure 2-2i
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations

Map Document: (C:\GIS\Projects\Portland_Harbor\LWG-Map-Projects\FSP_04\FSP_Moved_040308.mxd)
Plot Date:06-21-2004

N

0 250 500 1,000 Feet

Figure 2-2j
Portland Harbor RI/FS
Round 2 Field Sampling Plan
Subsurface Sediment Locations

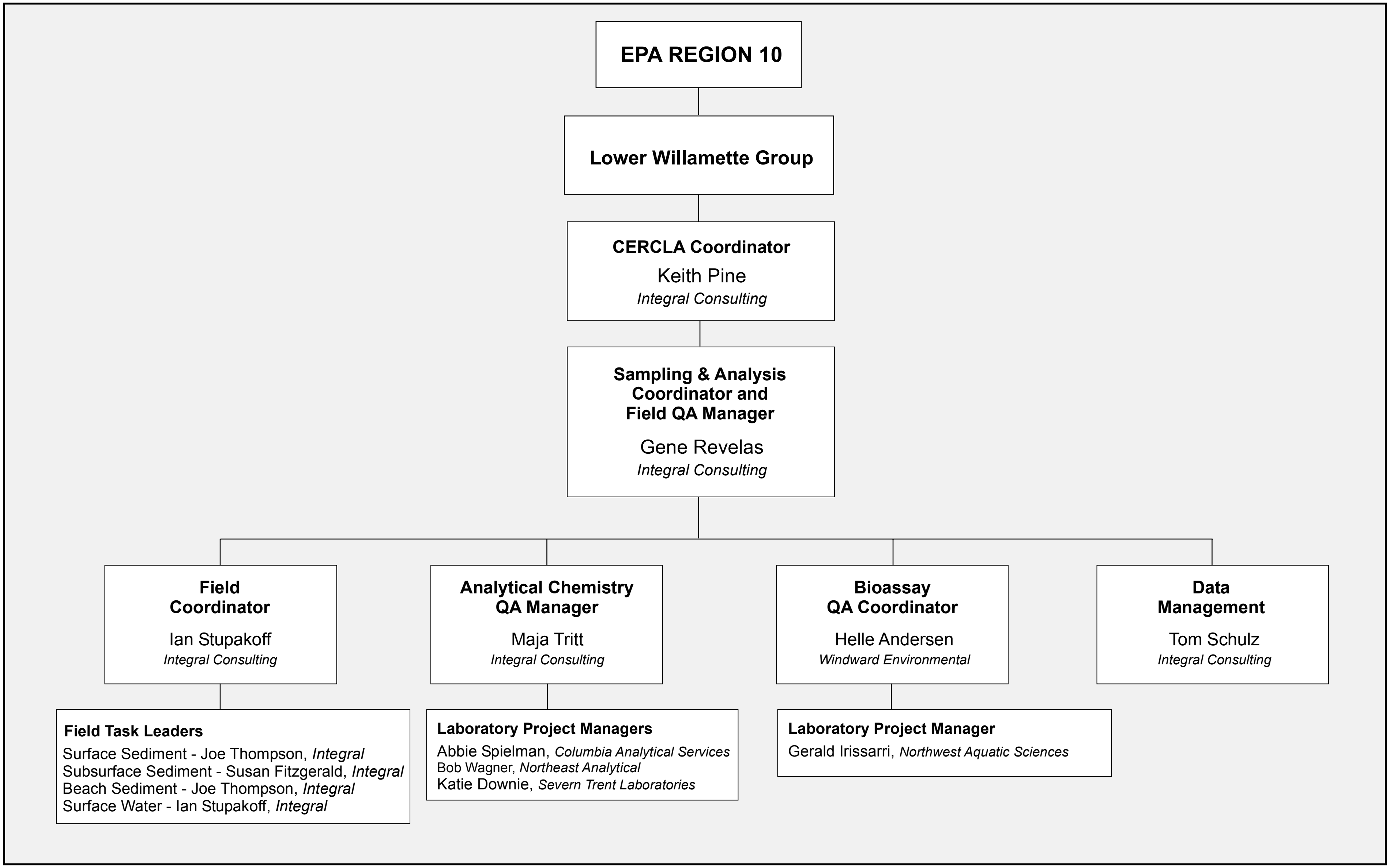

Figure 3-1. Round 2 Project Organization

Table 2-1. Summary of Round 2 Sediment Sample Types, Numbers, and Chemical Analyses.

Sample Type	Number of Individual Samples for Analysis[1]	CHEMICAL ANALYSES[2]											BIOASSAYS
		Metals	SVOCs	PCB Aroclors	Chlorinated Pesticides	TPH	TBT	VOCs	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Other[3]	28-day Hyalella, 10-day Chironomus
Surface Sediment Chemistry													
Chemistry only	298	X	X	X	X	X	X	X	X	X	X	X	
Synoptic chemistry and bioassay	219	X	X	X	X	X	X	X	X	X	X	X	X
Total:	*517*												
Subsurface Sediment Chemistry (Estimate)													
Round 2A	496	X	X	X	X	X	X	X	X	X	X	X	
Round 2B	86	X	X	X	X	X	X	X	X	X	X	X	
Total:	*582*												

[1] QC samples not included, see Table 4-3. The number of archived subsurface samples are not included here and will be a function of the real-time core processing

[2] See Table 4-3 for the estimated number of samples being analyzed for each chemical or chemical group

[3] TOC, solids, grain size, and specific gravity will be analyzed in all samples; Atterberg Limits on will be analyzed in 10% of sediment samples.

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1] X	Y
001			River miles 1-2	X	X	X	X								7616479.13	726306.10
002			River miles 1-2	X	X	X	X								7617338.58	725762.67
003			River miles 2-3	X	X	X	X								7615833.44	725273.16
004			River miles 1-2	X	X	X	X								7617923.96	725223.51
005			River miles 2-3	X	X	X	X								7616747.12	724899.86
006			River miles 2-3	X	X	X	X								7617428.83	724754.15
007		Oregon Steel Mills	North current outfall	X	X	X	X	X						X	7617517.30	724526.04
008			River miles 2-3	X	X	X	X								7616982.38	724492.65
009		Oregon Steel Mills	North current outfall	X	X	X	X	X						X	7617573.78	724483.87
010		Oregon Steel Mills	North current outfall	X	X	X	X	X						X	7617478.05	724429.17
011		Oregon Steel Mills	North current outfall	X	X	X	X	X						X	7617544.99	724397.59
012			River miles 2-3	X	X	X	X								7615598.65	724351.94
013		Oregon Steel Mills	Abandoned outfall, north	X	X	X	X	X							7617316.39	724106.09
014			River miles 2-3	X	X	X	X								7616810.17	724078.09
015		Oregon Steel Mills	Abandoned outfall, north	X	X	X	X	X						X	7617384.13	724061.92
016		Oregon Steel Mills	Dock - north end, submerged out	X	X	X	X	X							7617190.29	723963.52
017		Bioassay Samples	River miles 2-3	X	X	X	X	X						X	7617311.00	723915.21
018			River miles 2-3	X	X	X	X								7616403.95	723905.51
019		Bioassay Samples	River miles 2-3	X	X	X	X	X						X	7617329.75	723884.99
020		Oregon Steel Mills	downstream/inside OSM dock	X	X	X	X	X			X	X		X	7617167.55	723649.62
021		Oregon Steel Mills	Dock - middle	X	X	X	X	X							7617040.05	723636.65
022		Oregon Steel Mills	center of shoal off OSM dock	X	X	X	X	X							7616847.28	723636.34
023			River miles 2-3	X	X	X	X								7615270.90	723619.04
024		Oregon Steel Mills	Abandoned outfall-hist dock loc	X	X	X	X	X						X	7617048.55	723374.67
025		Oregon Steel Mills	Abandoned outfall-hist dock loc	X	X	X	X	X						X	7617141.26	723359.22
026		Oregon Steel Mills	Abandoned outfall, south	X	X	X	X	X						X	7616971.29	723178.94
027		Oregon Steel Mills	Abandoned outfall, south	X	X	X	X	X						X	7617053.70	723075.92
028	2		River miles 2-3	X	X	X	X								7616988.74	722787.72
029			River miles 2-3	X	X	X	X								7615546.91	722696.07
030			River miles 2-3	X	X	X	X								7616746.18	722576.14
031	2		River miles 2-3	X	X	X	X								7616873.97	722195.62
032			River miles 2-3	X	X	X	X								7616729.82	722069.18
033		Consolidated Metco	Adjacent to city outfall-53A	X	X	X	X	X						X	7616835.31	721928.17
034		Consolidated Metco	Adjacent to city outfall-53A	X	X	X	X	X						X	7616896.27	721904.86
035		Consolidated Metco	Adjacent to city outfall-53A	X	X	X	X	X						X	7616796.27	721869.60
036			River miles 2-3	X	X	X	X								7616038.57	721855.43
037			River miles 2-3	X	X	X	X								7615210.28	721849.86
038	2	Consolidated Metco	Adjacent to city outfall-53A	X	X	X	X	X			X	X		X	7616854.46	721842.88
039			River miles 2-3	X	X	X	X								7616609.90	721545.86
040			River miles 2-3	X	X	X	X								7616836.99	721279.87
041			River miles 2-3	X	X	X	X								7615606.87	721104.31
042			River miles 2-3	X	X	X	X								7616506.32	721055.25
043			River miles 2-3	X	X	X	X								7616804.23	720820.58
044			River miles 3-4	X	X	X	X								7616778.88	720586.45
045			River miles 2-3	X	X	X	X								7614909.41	720447.70
046			River miles 3-4	X	X	X	X								7616862.78	720354.84
047			River miles 2-3	X	X	X	X								7613187.51	720326.72
048			River miles 2-3	X	X	X	X								7614043.68	720185.59
049			River miles 3-4	X	X	X	X								7614841.36	719939.49
050			River miles 3-4	X	X	X	X								7616891.96	719929.43
051			River miles 3-4	X	X	X	X								7616838.85	719741.51

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1] X	Y
052			River miles 3-4	X	X	X	X								7615401.76	719708.58
053			River miles 3-4	X	X	X	X								7616977.07	719558.28
054			River miles 3-4	X	X	X	X								7614789.42	719467.56
055			River miles 3-4	X	X	X	X								7616909.71	719310.86
056			River miles 3-4	X	X	X	X								7616275.08	719304.31
057			River miles 3-4	X	X	X	X								7615879.43	718923.82
058			River miles 3-4	X	X	X	X								7617002.38	718825.70
059			River miles 3-4	X	X	X	X								7617210.03	718624.84
060		Linnton Oil Fire Training Grour	Downstream of discharge point	X	X	X	X	X		X	X			X	7615484.01	718582.56
061		Time Oil	North end of dock	X	X			X		X	X			X	7617116.48	718571.24
062		Time Oil	Another outfall	X	X	X	X	X		X	X			X	7617347.80	718365.29
063			River miles 3-4	X	X	X	X								7615895.79	718362.35
064		Linnton Oil Fire Training Grour	Adjacent to middle tower	X	X	X	X	X		X	X			X	7615588.45	718263.98
065			River miles 3-4	X	X	X	X								7617394.51	718159.49
066		Georgia Pacific Linnton Site	North end of dock	X	X	X	X				X			X	7615771.87	718037.14
067		Premier Edible Oil	Off dock	X	X	X	X	X		X				X	7617434.90	717956.06
068			River miles 3-4	X	X	X	X								7617378.52	717893.54
069			River miles 3-4	X	X	X	X								7616831.18	717845.74
070			River miles 3-4	X	X	X	X								7615966.65	717822.68
071			River miles 3-4	X	X	X	X								7617617.20	717692.57
072			River miles 3-4	X	X	X	X								7615885.52	717653.33
073		Premier Edible Oil	West of outfall	X	X	X	X	X		X				X	7617656.66	717559.81
074		Premier Edible Oil	South of outfalls	X	X	X	X	X		X				X	7617787.27	717460.69
075			River miles 3-4	X	X	X	X								7617607.47	717413.84
076			River miles 3-4	X	X	X	X								7616271.92	717359.33
077		Georgia Pacific Linnton Site	Outfall 4, LWG sample	X	X	X	X				X			X	7616012.49	717332.37
078		International Slip	Off outfall	X	X	X	X		X	X				X	7618792.28	717326.54
079		International Slip	Off outfall	X	X	X	X		X	X				X	7619303.46	717305.21
080		International Slip	Two outfalls	X	X	X	X		X	X				X	7619963.77	717250.83
081			River miles 3-4	X	X	X	X								7617333.42	717238.51
082		International Slip	Slip close to river	X	X	X	X		X	X				X	7618034.27	717200.85
083		International Slip	Mid Slip	X	X	X	X		X	X				X	7618749.19	717174.24
084		International Slip	Channel Far inside Slip	X	X		X		X	X					7619297.85	717160.94
085		International Slip	Head of slip	X	X	X	X		X	X				X	7619877.59	717108.33
086		International Slip	Outfall 9	X	X	X	X	X	X	X	X	X		X	7618576.40	717088.91
087		International Slip	Outfalls 11, 10	X	X		X		X	X					7618658.94	717084.06
088		International Slip	Outfall 8	X	X	X	X		X	X				X	7618370.06	717062.21
089		Northwest Pipe	Outfall 18	X	X	X	X		X	X				X	7619976.10	717055.15
090		International Slip	Outfall 12	X	X	X	X		X	X				X	7618908.98	717054.93
091		International Slip	Outfall 13	X	X	X	X		X	X				X	7619190.58	717047.64
092		International Slip	Outfall 17	X	X	X	X		X	X				X	7619878.97	717043.91
093		International Slip	Outfalls 14, 15, 16	X	X	X	X		X	X				X	7619489.17	717042.79
094		International Slip	Outfalls 14, 15, 16	X	X		X		X	X					7619574.14	717040.36
095			River miles 3-4	X	X	X	X								7616152.75	717022.09
096		Schnitzer Steel	Outfall 7	X	X	X	X		X	X				X	7617986.27	716932.81
097			River miles 3-4	X	X	X	X								7616506.32	716879.62
098			River miles 3-4	X	X	X	X								7617776.46	716846.91
099		Schnitzer Steel	Outfall 6	X	X	X	X		X	X				X	7618018.06	716712.64
100			River miles 3-4	X	X	X	X								7616364.09	716601.31
101			River miles 3-4	X	X	X	X								7616615.35	716405.36
102			River miles 3-4	X	X	X	X								7617282.42	716388.31

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1]	
															X	Y
103		Schnitzer Steel	Outfall 5	X	X	X	X		X	X				X	7618198.73	716380.69
104			River miles 3-4	X	X	X	X								7617972.70	716367.20
105		Owens Corning - Linnton	Downstream of outfall	X	X	X	X	X			X	X		X	7616422.81	716356.41
106		Schnitzer Steel	Outfall 4	X	X	X	X		X	X				X	7618326.36	716108.17
107			River miles 3-4	X	X	X	X								7616556.37	716099.14
108			River miles 3-4	X	X	X	X								7618204.06	715952.71
109		Schnitzer Steel	Outfall 3	X	X	X	X		X	X				X	7618393.78	715936.86
110			River miles 3-4	X	X	X	X								7616802.35	715914.75
111		Schnitzer Steel	Dock with Conveyer	X	X	X	X	X	X	X	X	X		X	7618428.32	715748.88
112		Schnitzer Steel	Outfall 2	X	X	X	X		X	X				X	7618559.41	715598.37
113			River miles 3-4	X	X	X	X								7616991.48	715418.69
114		Kinder-Morgan	East of 67 on -40	X	X			X							7617559.22	715242.14
115		Kinder-Morgan	East of 66	X	X			X		X					7617321.60	715238.09
116		Kinder-Morgan	North end of dock, on -30	X	X	X	X	X		X					7617048.85	715198.37
117		Owens Corning - Linnton	Address PAHs at south end of si	X	X	X	X							X	7616845.22	715084.84
118		Kinder-Morgan	East of site on -36	X	X			X		X					7617393.34	714972.59
119			River miles 4-5	X	X	X	X								7617865.55	714932.87
120			River miles 4-5	X	X	X	X								7617144.12	714917.18
121		Kinder-Morgan	Outfall	X	X	X	X	X		X				X	7616984.52	715146.49
122		Kinder-Morgan	Seep-1, Sediment 1	X	X	X	X	X		X				X	7617183.45	714760.88
123		Kinder-Morgan	Seep 2, SS-24	X	X	X	X	X		X				X	7616998.54	714870.09
124		Kinder-Morgan	Seep 4, Outfall	X	X	X	X	X		X				X	7617091.46	714666.48
125			River miles 4-5	X	X	X	X								7617405.77	714459.28
126		Kinder-Morgan	Seep 3, Sediment 3	X	X			X		X					7617166.10	714501.72
127		Kinder-Morgan	South end of dock	X	X	X	X	X		X	X	X		X	7617299.71	714222.71
128			River miles 4-5	X	X	X	X								7618365.30	714002.61
129			River miles 4-5	X	X	X	X								7617689.24	713979.57
130		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7617465.73	713870.51
131			River miles 4-5	X	X	X	X								7617912.74	713505.32
132			River miles 4-5	X	X	X	X								7617851.58	713179.80
133		Linnton Plywood Association	Outfall 6	X	X	X	X	X			X	X		X	7617896.67	713028.68
134			River miles 4-5	X	X	X	X								7618125.33	713014.71
135		Linnton Plywood Association	Outfall 5, steam cleaning, shop	X	X		X	X							7617960.37	712824.52
136		Linnton Plywood Association	Green Wood	X	X	X	X	X						X	7618121.59	712564.30
137			River miles 4-5	X	X	X	X								7618321.58	712556.80
138		Linnton Plywood Association	Outfalls 3 and 4	X	X		X	X							7618107.10	712422.88
139		Linnton Plywood Association	Outfall 2	X	X	X	X	X						X	7618123.34	712279.96
140			River miles 4-5	X	X	X	X								7618427.95	712197.51
141			River miles 4-5	X	X	X	X								7618577.78	712098.90
142		Linnton Plywood Association	Columbia Sand and Gravel outfal	X	X	X	X	X						X	7618366.10	712004.68
143			River miles 4-5	X	X	X	X								7618532.87	711781.20
144		Arco/BP	Transect 5, -40	X	X			X		X					7618800.47	711743.07
145		Arco/BP	Transect 5, middle	X	X			X		X					7618701.48	711706.59
146			River miles 4-5	X	X	X	X								7619460.55	711625.30
147		Arco/BP	Transect 5, nearshore	X	X	X	X	X		X				X	7618534.57	711624.99
148		Arco/BP	Transect 4, -30	X	X			X		X					7618842.64	711483.72
149			River miles 4-5	X	X	X	X								7620421.14	711436.21
150		Arco/BP	Transect 4, middle	X	X	X	X	X		X					7618740.17	711428.54
151		Arco/BP	Transect 4, nearshore and outfa	X	X			X		X				X	7618650.83	711386.50
152		Arco/BP	Transect 3, -30	X	X			X		X					7618935.38	711358.43
153			River miles 4-5	X	X	X	X								7618818.89	711289.70

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1] X	Y
154			River miles 5-6	X	X	X	X								7620327.63	711270.32
155		Arco/BP	Transect 3, nearshore	X	X	X	X	X		X				X	7618733.05	711242.82
156		Arco/BP	Transect 2, -30	X	X			X		X					7618980.05	711237.56
157		Arco/BP	Middle transect 2	X	X	X	X	X		X				X	7618870.84	711174.79
158		Arco/BP	Transect 1, -30	X	X			X		X					7619022.09	711161.36
159			River miles 5-6	X	X	X	X								7620576.48	711128.91
160		Arco/BP	Middle transect 1	X	X	X	X	X		X				X	7618917.22	711105.31
161		Arco/BP	north of dock	X	X	X	X	X		X				X	7618936.55	711018.54
162		Arco/BP	south of dock, -30	X	X			X		X					7619152.71	710960.98
163		Arco/BP	south of dock	X	X	X	X	X		X	X	X		X	7619036.86	710917.30
164		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7620735.87	710917.24
165			River miles 5-6	X	X	X	X								7620616.54	710839.67
166		Mobil Oil Terminal	outfall transect -20/nearshore/	X	X	X	X	X		X				X	7619157.60	710764.59
167		Arco/BP	south end property, outfall	X	X	X	X	X		X				X	7619103.33	710729.29
168			River miles 5-6	X	X	X	X								7620829.15	710678.51
169		Mobil Oil Terminal	Transect 2, -30	X	X			X		X					7619384.29	710606.43
170		Mobil Oil Terminal	Transect 2, nearshore/beach	X	X	X	X	X		X				X	7619279.18	710575.12
171		Mobil Oil Terminal	Transect 3, -30	X	X	X	X	X		X					7619460.73	710495.72
172		Mobil Oil Terminal	Transect 3, nearshore/beach	X	X	X	X	X		X				X	7619385.65	710469.92
173		Mobil Oil Terminal	Transect 4, -30	X	X			X		X					7619545.28	710317.14
174		Mobil Oil Terminal	Middle transect 4	X	X			X		X					7619480.74	710283.80
175			River miles 5-6	X	X	X	X								7621090.62	710223.76
176		Mobil Oil Terminal	Transect 4, nearshore/beach	X	X	X	X	X		X				X	7619487.48	710206.25
177		Mobil Oil Terminal	Transect 5, -30	X	X			X		X					7619721.69	710100.34
178		Bioassay Samples	River miles 5-6	X	X	X	X	X						X	7620163.92	710029.50
179		Mobil Oil Terminal	Transect 5, nearshore/beach	X	X	X	X	X		X				X	7619618.89	710013.35
180		Bioassay Samples	River miles 5-6	X	X	X	X	X						X	7620227.99	709964.45
181			River miles 5-6	X	X	X	X								7621150.76	709934.77
182		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7619737.50	709931.64
183			River miles 5-6	X	X	X	X								7620572.57	709875.97
184		Mobil Oil Terminal	Transect 6, nearshore outfall	X	X	X	X	X		X				X	7619835.20	709792.26
185		Mobil Oil Terminal	Transect 6, -20	X	X			X		X	X	X			7619943.11	709765.58
186			River miles 5-6	X	X	X	X								7621353.16	709751.80
187		Mobil Oil Terminal	south end of property	X	X	X	X	X		X				X	7620093.82	709481.77
188			River miles 5-6	X	X	X	X								7621396.06	709476.87
189			River miles 5-6	X	X	X	X								7620267.66	709340.59
190			River miles 5-6	X	X	X	X								7621601.56	709315.60
191			River miles 5-6	X	X	X	X								7620369.64	709105.46
192		MarCom Shipyard	Downstream end of dry dock	X	X	X	X	X	X	X	X	X			7621671.56	709091.44
193			River miles 5-6	X	X	X	X								7621867.31	709000.97
194			River miles 5-6	X	X	X	X								7621121.56	708995.28
195			River miles 5-6	X	X	X	X								7620594.74	708937.20
196		MarCom Shipyard	Adjacent to drydock	X	X			X	X	X					7621748.52	708910.53
197		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7621965.12	708898.34
198		MarCom Shipyard	transect 1, nearshore	X	X	X	X	X	X	X				X	7622182.00	708765.99
199		MarCom Shipyard	Transect 2, nearshore	X	X	X	X	X	X	X				X	7622227.58	708758.65
200		Brix Maritime	North outfall	X	X	X	X		X	X				X	7620626.40	708748.52
201		MarCom Shipyard	middle Transect 1	X	X	X	X	X	X	X				X	7622139.85	708741.15
202		MarCom Shipyard	Transect 2, -20	X	X	X	X	X	X	X				X	7622047.92	708725.39
203		MarCom Shipyard	middle transect 2	X	X	X	X	X	X	X				X	7622144.31	708703.73
204		MarCom Shipyard	Barge wreck nearshore	X	X	X	X	X	X	X				X	7622243.52	708668.30

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1] X	Y
205		Brix Maritime	end of dock	X	X	X	X		X	X				X	7620707.98	708641.06
206		MarCom Shipyard	Barge wreck -20	X	X	X	X	X	X	X				X	7622089.39	708597.43
207		MarCom Shipyard	outfall at south property line	X	X	X	X	X	X	X	X	X		X	7622239.38	708584.77
208			River miles 5-6	X	X	X	X								7620981.77	708522.90
209		Bioassay Samples	River miles 5-6	X	X	X	X	X						X	7622270.67	708520.02
210		Brix Maritime	outside slip middle	X	X	X	X	X	X	X	X	X		X	7620899.01	708506.83
211		Brix Maritime	In slip middle	X	X	X	X		X	X				X	7620823.69	708492.11
212		Brix Maritime	in slip south	X	X	X	X		X	X				X	7620861.71	708441.55
213		Brix Maritime	South outfall	X	X	X	X		X	X				X	7621006.27	708375.70
214			River miles 5-6	X	X	X	X								7622350.03	708304.86
215		MarCom Shipyard	outfall -30	X	X			X	X	X					7622425.47	708260.18
216			River miles 5-6	X	X	X	X								7621842.13	708218.95
217			River miles 5-6	X	X	X	X								7621136.44	708214.16
218			River miles 5-6	X	X	X	X								7622643.38	708167.90
219		rm5-6 oily extents	downstream east of oily extent	X	X			X							7621519.48	708159.30
220		rm5-6 oily extents	downstream west of oily extent	X	X	X	X	X						X	7621466.02	708116.35
221		rm5-6 oily extents	on oily extent	X	X	X	X	X						X	7621535.53	708094.14
222			River miles 5-6	X	X	X	X								7621347.00	708075.90
223		rm5-6 oily extents	upstream of oily extent	X	X			X							7621579.22	708042.23
224			River miles 5-6	X	X	X	X								7622720.71	707912.37
225			River miles 5-6	X	X	X	X								7621452.88	707834.70
226			River miles 5-6	X	X	X	X								7622981.51	707819.20
227		Marine Finance	Seeps north end of property	X	X	X	X	X	X					X	7621406.12	707768.57
228		Marine Finance	Houseboat construction	X	X	X	X	X	X					X	7621484.79	707768.55
229			River miles 5-6	X	X	X	X								7621668.62	707694.32
230		Bioassay Samples	River miles 5-6	X	X	X	X	X						X	7621585.68	707639.87
231		Marine Finance	north of dock	X	X	X	X	X	X					X	7621716.27	707548.55
232		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7623199.83	707520.21
233			River miles 5-6	X	X	X	X								7623096.84	707519.88
234		Marine Finance	south of dock	X	X	X	X	X	X					X	7621766.01	707486.38
235			River miles 5-6	X	X	X	X							X	7622540.01	707433.86
236			River miles 5-6	X	X	X	X								7623305.45	707423.14
237			River miles 5-6	X	X	X	X								7622001.15	707312.73
238			River miles 6-7	X	X	X	X								7623451.17	707252.77
239			River miles 6-7	X	X	X	X								7623629.71	707207.53
240		Marine Finance	south of St. Johns bridge	X	X	X	X	X	X					X	7622005.37	707181.74
241			River miles 5-6	X	X	X	X								7621945.73	707087.65
242		Bioassay Samples	River miles 5-6	X	X	X	X	X						X	7622054.66	707077.28
243			River miles 6-7	X	X	X	X								7623691.03	707040.17
244		Crawford Street	Nearshore, downstream end of be	X	X	X	X							X	7623942.71	707010.83
245		Marine Finance	south of tow boat dock	X	X	X	X	X	X		X	X		X	7622154.58	706985.90
246			River miles 5-6	X	X	X	X								7622317.32	706936.60
247		Crawford Street	Nearshore downstream of outfall	X	X	X	X	X			X	X		X	7624112.28	706913.01
248			River miles 6-7	X	X	X	X								7623234.69	706711.58
249			River miles 6-7	X	X	X	X								7624088.97	706696.75
250			River miles 6-7	X	X	X	X								7624399.74	706669.36
251			River miles 6-7	X	X	X	X								7622758.87	706576.82
252		Gasco	Transect 2, -40	X	X	X	X	X							7623379.32	706491.50
253			River miles 6-7	X	X	X	X								7623669.98	706464.96
254		Willamette Cove	Nearshore of 244	X	X	X	X							X	7624863.85	706427.88
255		Willamette Cove	Most northwest	X	X	X	X								7624574.12	706391.48

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1] X	Y
256		Gasco	Transect 1, -40	X	X			X		X					7623611.45	706322.63
257		Willamette Cove	north of outfall	X	X	X	X								7625162.02	706278.38
258		Gasco	Transect 5, -40	X	X	X	X	X							7623837.60	706202.90
259			River miles 6-7	X	X	X	X								7623260.38	706173.43
260		Willamette Cove	west of outfall -30	X	X	X	X	X			X	X		X	7625323.31	706172.62
261			River miles 6-7	X	X	X	X								7624146.47	706171.37
262		Willamette Cove	outfall -30	X	X										7625037.48	706135.27
263	**2**	Gasco	Transect 2, nearshore	X	X	X	X	X		X				X	7623141.17	706106.52
264		Gasco	Transect 1, toe of slope	X	X	X	X	X		X				X	7623449.43	706060.93
265		Gasco	Transect 7, -40	X	X			X							7624083.10	706034.68
266		Willamette Cove	south of outfall	X	X	X	X								7625489.93	705971.73
267		Willamette Cove	east of outfall	X	X	X	X							X	7626016.90	705963.15
268		Willamette Cove	Another outfall	X	X	X	X							X	7625761.05	705961.32
269	**2**	Gasco	transect 1, nearshore	X	X	X	X	X		X				X	7623373.30	705958.37
270		Gasco	Transect 5, toe of slope	X	X	X	X	X		X				X	7623675.62	705923.38
271			River miles 6-7	X	X	X	X								7624606.01	705897.55
272		Gasco	Transect 8, -40	X	X	X	X	X							7624311.58	705889.14
273	**2**	Gasco	Transect 5, -5	X	X	X	X	X		X				X	7623638.52	705878.74
274		Gasco	Transect 5, nearshore	X	X	X	X	X		X				X	7623628.80	705819.65
275		Willamette Cove	south of outfall, -30	X	X				X						7625942.38	705791.84
276		Gasco	Transect 7, toe of slope	X	X	X	X	X		X				X	7623952.11	705778.73
277		Willamette Cove	north side of WC, -20, former drydock locale	X	X	X	X	X	X					X	7626684.11	705771.50
278		Gasco	Transect 6, -30	X	X	X	X	X		X				X	7623909.32	705765.36
280		Willamette Cove	next to outfall -20	X	X	X	X		X					X	7627021.38	705722.71
281		Wacker	Transect 11, -40	X	X			X							7624667.23	705721.24
282		Willamette Cove	nearshore, next to outfall	X	X	X	X							X	7627336.61	705701.34
283		Gasco	Transect 6, -5	X	X	X	X	X		X				X	7623867.87	705694.56
284		Gasco	Transect 8, toe of slope	X	X	X	X	X		X				X	7624189.70	705664.12
285			River miles 6-7	X	X	X	X								7625039.98	705659.98
287		Wacker	Transect 12, -40	X	X			X		X					7624843.38	705641.80
288	**2**	Gasco	Transect 8, -5	X	X	X	X	X		X				X	7624145.51	705585.72
289		Gasco	Transect 10, toe of slope	X	X			X		X					7624363.69	705561.24
290		Willamette Cove	mouth of WC -40	X	X				X						7626171.84	705525.02
291		Willamette Cove	center of WC, -20, former drydock locale	X	X			X	X						7626796.97	705519.68
292		Gasco	Transect 8, nearshore	X	X	X	X	X		X				X	7624109.70	705514.52
293		Willamette Cove	mouth of WC -30, former drydock locale	X	X	X	X	X	X						7626525.66	705497.48
294		Gasco	Transect 10, -5	X	X	X	X	X		X				X	7624334.13	705494.24
295		Willamette Cove	center of WC, -20	X	X	X	X							X	7627095.76	705483.75
296		Bioassay Samples	River miles 6-7	X	X	X	X	X						X	7627328.43	705467.34
297		Wacker	Transect 11, toe of slope	X	X			X		X					7624513.94	705462.01
298		Gasco	Transect 10, nearshore	X	X	X	X	X		X				X	7624297.87	705428.62
299		Wacker	Transect 12, toe of slope	X	X			X		X					7624673.41	705378.80
300		Wacker	Transect 14, -40	X	X			X		X					7625363.17	705374.13
301	**2**	Wacker	Transect 11, nearshore	X	X	X	X	X		X				X	7624457.95	705330.34
302		Wacker	Transect 12, -5	X	X	X	X	X		X				X	7624632.88	705316.37
303		Bioassay Samples	River miles 6-7	X	X	X	X	X						X	7627149.89	705314.43
304		Wacker	Transect 12, nearshore	X	X	X	X	X		X				X	7624598.35	705257.66
305		Wacker	Transect 13, toe of slope	X	X	X	X	X		X					7624923.20	705224.98
306			River miles 6-7	X	X	X	X								7626145.32	705211.95
307		Wacker	Transect 15, -40	X	X	X	X	X		X	X	X			7625788.93	705197.12
308		Bioassay Samples	River miles 6-7	X	X	X	X	X						X	7624819.29	705150.51

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1]	
															X	Y
309		Wacker	Transect 14, toe of slope	X	X	X	X	X		X					7625170.00	705071.17
310			River miles 6-7	X	X	X	X								7626456.46	705066.34
311		Wacker	Transect 14, -5	X	X	X	X	X		X				X	7625137.14	705014.16
312		Wacker	Transect 14, nearshore	X	X	X	X	X		X				X	7625097.42	704952.00
313		Wacker	Transect 16, -40	X	X	X	X	X		X	X	X			7626344.56	704902.30
314		Wacker	Transect 15, toe of slope	X	X	X	X	X		X	X	X			7625557.25	704832.87
315		Wacker	Transect 15, -5	X	X	X	X	X		X	X	X		X	7625536.36	704790.38
316		Wacker	Transect 15, nearshore	X	X	X	X	X		X	X	X		X	7625502.35	704711.00
317		Wacker	Transect 16, -35	X	X	X	X	X		X	X	X			7626194.20	704669.65
318			River miles 6-7	X	X	X	X							X	7625784.87	704616.06
319			River miles 6-7	X	X	X	X								7626784.34	704525.82
320		Bioassay Samples	River miles 6-7	X	X	X	X	X						X	7625876.45	704517.32
321		Wacker	Transect 16, -5	X	X	X	X	X		X	X	X		X	7626065.54	704446.42
322			River miles 6-7	X	X	X	X								7626269.45	704374.53
323		Wacker	Transect 16, nearshore	X	X	X	X	X		X	X	X		X	7626012.62	704367.04
324		Rhone Poulenc	Farthest north	X	X	X	X			X	X	X		X	7626164.06	704325.30
325		Rhone Poulenc	Farther in river from 239	X	X	X	X			X	X	X			7626363.07	704274.08
326		Rhone Poulenc	Transect 1, -30	X	X	X	X			X	X	X			7626466.07	704265.12
327		Rhone Poulenc	Southeast boundary of Wacker	X	X	X	X			X	X	X		X	7626235.83	704228.00
328			River miles 6-7	X	X	X	X								7627157.40	704174.92
329		Rhone Poulenc	Transect 1, -20	X	X	X	X			X	X	X		X	7626362.74	704163.96
330		Rhone Poulenc	Farther in river from 241	X	X	X	X			X	X	X			7626522.05	704074.79
331		Rhone Poulenc	transect 1, nearshore	X	X	X	X			X	X	X		X	7626289.52	704072.39
332		Rhone Poulenc	Transect 2, -30	X	X	X	X			X	X	X			7626627.30	704059.11
333		Rhone Poulenc	South of bridge, nearshore	X	X	X	X			X	X	X		X	7626419.05	703994.18
334		Rhone Poulenc	Transect 2, -20	X	X	X	X			X	X	X		X	7626524.29	703956.11
335		Rhone Poulenc	Transect 2, nearshore	X	X	X	X			X	X	X		X	7626463.83	703888.93
336			River miles 6-7	X	X	X	X							X	7626725.61	703653.23
337		Atofina	Transect 1, channel	X	X	X							X		7627852.45	703611.70
338			River miles 7-8	X	X	X	X								7627027.17	703605.91
339		Bioassay Samples	River miles 7-8	X	X	X	X	X						X	7626956.90	703406.25
340			River miles 7-8	X	X	X	X								7629129.32	703366.21
341		Atofina	Middle transect 1	X	X	X							X		7627555.20	703333.66
342		Triangle Park	downstream edge of cove	X	X	X	X	X	X					X	7629483.81	703269.06
343		Atofina	Transect 2, across river from s	X	X	X							X		7628722.31	703259.48
344			River miles 7-8	X	X	X	X								7627414.21	703257.03
345		Bioassay Samples	River miles 7-8	X	X	X	X	X						X	7627189.51	703213.96
346		Triangle Park	outfall in cove	X	X	X	X	X	X					X	7629672.74	703123.73
347		Triangle Park	high concs in cove	X	X	X	X	X	X					X	7629827.76	703080.13
348		Atofina	transect 1, nearshore	X	X	X	X			X			X	X	7627254.76	703067.37
349		Atofina	Transect 2, channel	X	X	X							X		7628391.44	702933.96
350		Bioassay Samples	River miles 7-8	X	X	X	X	X		X				X	7627496.55	702916.23
351		Atofina	Northern dock	X	X	X	X	X			X	X	X	X	7627729.71	702757.85
352	**2**	Triangle Park	upstream outfall	X	X	X	X	X	X					X	7629918.88	702618.49
353		Bioassay Samples	River miles 7-8	X	X	X	X	X		X				X	7627786.08	702597.59
354			River miles 7-8	X	X	X	X								7629649.21	702581.08
355		Bioassay Samples	River miles 7-8	X	X	X	X	X		X				X	7627863.77	702473.72
356		Atofina	Middle dock	X	X	X				X			X		7628145.96	702304.24
357		Atofina	Transect 3- Channel	X	X	X							X		7629145.30	702293.58
358			River miles 7-8	X	X	X	X								7628411.78	702155.88
359		Atofina	North metal transect -20	X	X	X	X			X			X	X	7628284.71	702149.48

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1]	
															X	Y
360		Atofina	North metal transect, nearshore	X	X	X	X			X			X	X	7628220.67	702096.12
361		Atofina	Transect 3- Channel	X	X	X							X		7628852.88	702007.25
362		Atofina	South metal transect, -20	X	X	X	X						X	X	7628429.68	701983.17
363	**2**		River miles 7-8	X	X	X	X								7630871.13	701942.45
364		Portland Shipyard	Coast Guard	X	X	X	X		X					X	7633229.91	701940.78
365			River miles 7-8	X	X	X	X								7629437.57	701925.66
366		Atofina	South metal transect, nearshore	X	X	X	X						X	X	7628354.96	701925.35
367		Bioassay Samples	River miles 8-9	X	X	X	X	X						X	7632893.15	701900.46
368		Atofina	Southern dock	X	X	X	X						X	X	7628524.86	701807.94
369			River miles 7-8	X	X	X	X								7628727.95	701752.49
370	**2**		River miles 7-8	X	X	X	X								7631397.96	701703.37
371		Bioassay Samples	River miles 7-8	X	X	X	X	X						X	7628511.74	701694.13
372		Portland Shipyard	downstream of shipyard	X	X	X	X	X	X		X	X		X	7632672.95	701608.49
373		Portland Shipyard	downstream of shipyard	X	X		X		X						7630470.58	701579.51
374			River miles 7-8	X	X	X	X								7629098.63	701392.71
375		Portland Shipyard	downstream of shipyard	X	X		X		X						7631320.62	701318.70
376		Bioassay Samples	River miles 8-9	X	X	X	X	X						X	7632584.13	701177.66
377		Willbridge	NW corner Willbridge cove	X	X	X	X	X			X	X		X	7628450.13	701158.83
378			River miles 7-8	X	X	X	X								7629946.30	701128.98
379		Portland Shipyard	Swan Island Lagoon Center Trans	X	X	X	X		X						7633965.55	701096.63
380		Portland Shipyard	SI Lagoon mainland shoreline	X	X	X	X		X					X	7634417.32	701090.22
381		Willbridge	Off Chevron Pier	X	X	X	X	X		X					7629322.85	701083.36
382		Portland Shipyard	Swan Island Lagoon PSY shorelin	X	X	X	X	X	X					X	7633573.68	701040.80
383		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7634657.57	700871.91
384		Portland Shipyard	PSY-downstream	X	X	X	X	X	X					X	7632708.52	700799.45
385		Portland Shipyard	Swan Island Lagoon Center Trans	X	X	X	X	X	X					X	7634357.50	700779.01
386		Portland Shipyard	downstream of shipyard	X	X	X	X		X					X	7631219.69	700771.78
387		Bioassay Samples	River miles 8-9	X	X	X	X	X						X	7631472.64	700751.24
388		Portland Shipyard	SI Lagoon mainland shoreline	X	X		X		X						7634811.69	700724.58
389			River miles 7-8	X	X	X	X							X	7628584.49	700666.25
390		Bioassay Samples	River miles 8-9	X	X	X	X	X						X	7632883.12	700580.47
391			River miles 7-8	X	X	X	X								7629703.72	700493.26
392		Portland Shipyard	PSY-downstream	X	X	X	X	X	X					X	7632324.14	700479.13
393		Portland Shipyard	Swan Island Lagoon PSY shorelin	X	X	X	X		X					X	7634313.37	700447.50
394			River miles 7-8	X	X	X	X								7628835.27	700365.84
395			River miles 8-9	X	X	X	X								7631736.26	700348.90
396		Portland Shipyard	SI Lagoon mainland shoreline	X	X	X	X		X					X	7635243.16	700348.30
397		Portland Shipyard	Swan Island Lagoon Center Trans	X	X	X	X	X	X		X	X			7634969.44	700280.30
398		Bioassay Samples	River miles 8-9	X	X	X	X	X						X	7632193.69	700245.24
399			River miles 7-8	X	X	X	X								7629577.40	700205.98
400		Portland Shipyard	PSY-downstream	X	X		X		X						7631382.20	700172.84
401		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7629028.45	700149.31
402		Portland Shipyard	Swan Island Lagoon PSY shorelin	X	X		X	X	X						7634696.03	700125.68
403		Willbridge	McCall Pier	X	X	X	X	X		X	X	X		X	7629828.17	700119.21
404		Willbridge	SW corner Willbridge cove	X	X	X	X	X		X					7629096.23	700092.12
405		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7635944.86	699903.72
406			River miles 8-9	X	X	X	X								7632086.39	699830.75
407			River miles 7-8	X	X	X	X								7630139.64	699827.21
408		Bioassay Samples	River miles 8-9	X	X	X	X	X						X	7635085.59	699821.44
409			River miles 8-9	X	X	X	X					X		X	7632511.05	699783.31
410			River miles 8-9	X	X	X	X								7630406.93	699740.99

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1]	
															X	Y
411		Portland Shipyard	SI Lagoon mainland shoreline	X	X		X		X						7636110.31	699718.93
412			River miles 8-9	X	X	X	X								7632641.92	699561.10
413		Front Avenue LLP	near Front Avenue outfall	X	X	X	X							X	7630350.38	699530.31
414			River miles 8-9	X	X	X	X								7631327.26	699524.15
415		Portland Shipyard	Swan Island Lagoon PSY shorelin	X	X	X	X		X					X	7635472.34	699486.08
416		Bioassay Samples	River miles 8-9	X	X	X	X	X						X	7635988.02	699452.26
417		Portland Shipyard	SI Lagoon mainland shoreline	X	X	X	X		X					X	7636481.04	699412.75
418			River miles 8-9	X	X	X	X								7630779.29	699358.24
419			River miles 8-9	X	X	X	X								7633078.02	699272.19
420		City Outfalls	Near Outfall	X	X	X	X	X			X	X		X	7633292.41	699197.27
421		Portland Shipyard	Swan Island Lagoon PSY shorelin	X	X		X		X						7635853.36	699175.27
422			River miles 8-9	X	X	X	X								7630829.28	699114.44
423			River miles 8-9	X	X	X	X								7631090.86	698978.20
424			River miles 8-9	X	X	X	X								7633356.04	698966.92
425		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7636991.51	698955.36
426		Portland Shipyard	Swan Island Lagoon PSY shorelin	X	X	X	X	X	X		X	X		X	7636226.71	698838.42
427			River miles 8-9	X	X	X	X								7631422.46	698624.35
428			River miles 8-9	X	X	X	X								7632222.18	698579.88
429			River miles 8-9	X	X	X	X								7634042.55	698501.62
430		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7636719.71	698383.66
431		Shaver Transportation	near shoreline seep / outfall	X	X	X	X		X						7631233.38	698272.89
432		City Outfalls	Near Outfall	X	X	X	X	X				X			7631229.69	698196.14
433			River miles 8-9	X	X	X	X								7634391.77	698094.72
434		Shaver Transportation	inside dock	X	X	X	X		X						7631310.35	698070.67
435			River miles 8-9	X	X	X	X								7633023.51	697854.87
436		Lakeside Industries	at end of northern dock	X	X		X		X						7631912.70	697829.83
437		Lakeside Industries	In front of Lakeside Industries	X	X	X	X	X	X		X	X		X	7631465.84	697829.51
438			River miles 8-9	X	X	X	X								7634887.49	697764.42
439		Lakeside Industries	Off of private outfall	X	X	X	X		X	X					7631591.54	697644.83
440		Gunderson	ds of southern dock	X	X		X		X						7632318.69	697561.87
441		Gunderson	Adjacent to southern dock	X	X	X	X		X	X				X	7632095.55	697528.56
442			River miles 9-10	X	X	X	X								7635263.96	697407.87
443			River miles 8-9	X	X	X	X								7633895.70	697255.24
444		Gunderson	off Gunderson	X	X	X	X		X	X				X	7632432.37	697249.26
445		Gunderson	off Gunderson	X	X	X	X	X	X	X				X	7632168.48	697241.14
446			River miles 9-10	X	X	X	X								7635686.26	697194.94
447		Gunderson	off Gunderson	X	X		X	X	X						7632627.24	697103.11
448		Shell/ Texaco	At dock	X	X		X	X	X						7633101.24	697061.28
449		Gunderson	Gunderson box	X	X		X		X						7633644.35	696966.68
450		Shell/ Texaco	At dock	X	X	X	X	X	X		X	X		X	7633355.78	696917.37
451			River miles 9-10	X	X	X	X								7636098.00	696835.49
452		Gunderson	Gunderson box	X	X		X		X						7634062.45	696768.46
453		Gunderson	Gunderson box	X	X	X	X	X	X					X	7633506.35	696754.86
454		City Outfalls	Near Outfall	X	X	X	X	X			X	X		X	7636605.75	696736.29
455		City Outfalls	Near Outfall	X	X	X	X	X				X		X	7633294.33	696673.56
456		Gunderson	Gunderson box	X	X	X	X		X					X	7633718.16	696652.16
457		Gunderson	Gunderson box	X	X	X	X		X					X	7633934.18	696548.30
458		Gunderson	Gunderson box	X	X	X	X		X					X	7634218.48	696530.11
459			River miles 9-10	X	X	X	X								7636816.89	696528.12
460		Gunderson	Gunderson box	X	X		X		X						7634502.77	696511.92
461		Gunderson	Gunderson box	X	X	X	X		X					X	7634374.50	696291.76

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	**Footnote**	**Nearby Facility**	**Location**	**SVOCs**	**Metals**	**Chlorinated Pesticides**	**PCBs**	**TPH**	**Butyltins**	**VOCS**	**Dioxins /Furans**	**Chlorinated Herbicides**	**Hexavalent Chromium**	**Bioasssays**	**SAMPLE LOCATION COORDINATES[1]**	
															X	**Y**
462		Gunderson	Gunderson box	X	X		X		X						7634658.79	696273.56
463			River miles 9-10	X	X	X	X								7637250.34	696261.12
464		Gunderson	Gunderson box	X	X		X		X						7634943.08	696255.37
465			River miles 9-10	X	X	X	X								7636959.29	696252.21
466			River miles 9-10	X	X	X	X								7635634.64	696066.87
467		Gunderson	Gunderson box	X	X	X	X		X					X	7634530.52	696053.41
468		Gunderson	Gunderson box	X	X	X	X		X					X	7634814.81	696035.21
469		Gunderson	Gunderson box	X	X	X	X		X					X	7635099.10	696017.02
470			River miles 9-10	X	X	X	X								7637411.74	696001.46
471		Gunderson	Gunderson box	X	X		X		X						7635383.40	695998.82
472			River miles 9-10	X	X	X	X								7637698.41	695977.56
473		Gunderson	Gunderson box	X	X	X	X	X	X					X	7634717.92	695939.39
474		Gunderson	Gunderson box	X	X	X	X	X	X		X	X		X	7635224.75	695869.78
475			River miles 9-10	X	X	X	X								7636087.09	695821.57
476			River miles 9-10	X	X	X	X								7637880.54	695745.25
477		Gunderson	Gunderson box	X	X	X	X	X	X					X	7635226.62	695707.82
478			River miles 9-10	X	X	X	X								7636947.74	695696.60
479			River miles 9-10	X	X	X	X								7635683.81	695669.21
480		James River Corporation	upstream of Gunderson	X	X	X	X		X					X	7635355.69	695624.30
481			River miles 9-10	X	X	X	X								7638606.38	695487.34
482			River miles 9-10	X	X	X	X								7636121.09	695379.90
483			River miles 9-10	X	X	X	X								7636992.00	695276.45
484			River miles 9-10	X	X	X	X								7638736.39	695211.03
485			River miles 9-10	X	X	X	X								7636561.18	695082.42
486			River miles 9-10	X	X	X	X								7637422.64	694971.18
487			River miles 9-10	X	X	X	X								7639692.60	694890.34
488			River miles 9-10	X	X	X	X								7636998.11	694792.33
489			River miles 9-10	X	X	X	X								7637815.13	694556.89
490			River miles 10-11	X	X	X	X								7639783.02	694551.43
491			River miles 10-11	X	X	X	X								7639968.22	694334.47
492			River miles 9-10	X	X	X	X							X	7637616.65	694315.76
493			River miles 9-10	X	X	X	X								7638191.26	694186.20
494		City Outfalls	Near Outfall	X	X	X	X								7637229.56	694147.29
495			River miles 10-11	X	X	X	X								7640110.09	694060.82
496			River miles 10-11	X	X	X	X								7639454.53	693961.60
497			River miles 9-10	X	X	X	X	X						X	7637273.35	693864.33
498			River miles 10-11	X	X	X	X								7640297.24	693833.01
499			River miles 10-11	X	X	X	X								7638790.90	693608.37
500			River miles 10-11	X	X	X	X								7640552.97	693370.73
501			River miles 10-11	X	X	X	X								7639101.62	693308.56
502			River miles 10-11	X	X	X	X								7640810.43	692965.74
503			River miles 10-11	X	X	X	X								7639641.00	692780.43
504			River miles 10-11	X	X	X	X								7640382.38	692628.03
505			River miles 10-11	X	X	X	X								7641162.74	692502.28
506			River miles 10-11	X	X	X	X								7639956.47	692321.72
507			River miles 10-11	X	X	X	X								7641425.11	692142.30
508			River miles 10-11	X	X	X	X								7640278.93	691991.42
509			River miles 10-11	X	X	X	X								7641774.30	691733.35
510			River miles 10-11	X	X	X	X								7640626.44	691501.74
511			River miles 10-11	X	X	X	X								7642106.89	691326.08
512			River miles 10-11	X	X	X	X								7641311.54	691248.36

Table 2-2. Round 2 Surface Sediment Chemistry and Toxicity Testing Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Bioasssays	SAMPLE LOCATION COORDINATES[1] X	Y
513			River miles 10-11	X	X	X	X								7642342.04	691039.33
514			River miles 10-11	X	X	X	X								7640894.68	690921.06
515			River miles 10-11	X	X	X	X								7641037.25	690794.01
516			River miles 10-11	X	X	X	X								7642841.83	690425.82
517			River miles 10-11	X	X	X	X								7641538.77	690386.67
518			River miles 10-11	X	X	X	X								7641989.98	689895.61
519			Terminal 4	X	X	X	X								7618413.79	715495.74
			Total Number of Analyses	517	517	461	476	205	108	145	51	58	14	219		

[1] - Oregon State Plane North. International Feet, NAD 83

[2] - This station has been selected for archaeological monitoring.

Table 2-3. Round 2 Subsurface Sediment Sample Locations and Analyses.

						ANALYTES										SAMPLE PHASING			SAMPLE LOCATION COORDINATES[1]	
Station Number	**Footnote**	**Nearby Facility**	**Location**	**Core Type[2]**	**Core Tube Length (ft)[2]**	**SVOCs**	**Metals**	**Chlorinated Pesticides**	**PCBs**	**TPH**	**Butyltins**	**VOCS**	**Dioxins /Furans**	**Chlorinated Herbicides**	**Hexavalent Chromium**	**Round 2A**	**Round 2B[2]**	**Round 3[2]**	**X**	**Y**
009		Oregon Steel Mills	North current outfall	N&E	14	X	X	X	X	X						1			7617573.78	724483.87
011		Oregon Steel Mills	North current outfall	FS, N&E	20	X	X	X	X	X						1			7617544.99	724397.59
015		Oregon Steel Mills	Abandoned outfall, north	N&E	14	X	X	X	X	X						1			7617384.13	724061.92
019		Oregon Steel Mills	near outfall	FS, N&E	20	X	X	X	X	X						1			7617329.75	723884.99
020		Oregon Steel Mills	LWG-specified location, inside	N&E [4]	14	X	X	X	X	X			X	X		1			7617167.55	723649.62
022		Oregon Steel Mills	LWG-specified location	N&E	14	X	X	X	X	X						1			7616847.28	723636.34
025		Oregon Steel Mills	Abandoned outfall-hist dock loc	FS, N&E	20	X	X	X	X	X						1			7617141.26	723359.22
027		Oregon Steel Mills	Abandoned outfall, south	N&E	14	X	X	X	X	X						1			7617053.70	723075.92
034		Consolidated Metco	Adjacent to city outfall-53A		14	X	X	X	X	X						1			7616896.27	721904.86
038	3	Consolidated Metco	Adjacent to city outfall-53A	FS, N&E	20	X	X	X	X	X			X	X		1			7616854.46	721842.88
060		Linnton Oil Fire Training Grounds	Downstream of discharge point	N&E, CSM	14	X	X	X	X	X		X	X			1			7615484.01	718582.56
061		Time Oil	North end of dock	N&E	14	X	X			X		X	X			1			7617116.48	718571.24
062		Time Oil	Another outfall	FS, N&E	20	X	X	X	X	X		X	X			1			7617347.80	718365.29
064		Linnton Oil Fire Training Grounds	Adjacent to middle tower	FS, N&E	20	X	X	X	X	X		X	X			1			7615588.45	718263.98
066		Georgia Pacific Linnton Site	North end of dock	N&E, CSM	20	X	X	X	X				X			1			7615771.87	718037.14
067		Premier Edible Oil	Off dock	N&E	20	X	X	X	X	X		X				1			7617434.90	717956.06
073		Premier Edible Oil	West of outfall	N&E	14	X	X	X	X	X		X				1			7617656.66	717559.81
074		Premier Edible Oil	South of outfalls	FS, N&E [4]	20	X	X	X	X	X		X				1			7617787.27	717460.69
077		Georgia Pacific Linnton Site	Outfall 4, LWG sample	N&E	14	X	X	X	X				X			1			7616012.49	717332.37
078		International Slip	Off outfall			X	X	X	X		X	X					1		7618792.28	717326.54
079		International Slip	Off outfall			X	X	X	X		X	X					1		7619303.46	717305.21
080		International Slip	Two outfalls			X	X	X	X		X	X					1		7619963.77	717250.83
082		International Slip	Slip close to river			X	X	X	X		X	X					1		7618034.27	717200.85
083		International Slip	Mid Slip			X	X	X	X		X	X					1		7618749.19	717174.24
084		International Slip	Channel Far inside Slip			X	X		X		X	X					1		7619297.85	717160.94
086		International Slip	Outfall 9	N&E	14	X	X	X	X	X	X	X	X	X		1			7618576.40	717088.91
087		International Slip	Outfalls 11, 10			X	X		X		X	X					1		7618658.94	717084.06
088		International Slip	Outfall 8			X	X	X	X		X	X					1		7618370.06	717062.21
089		Northwest Pipe	Outfall 18			X	X	X	X		X	X					1		7619976.10	717055.15
090		International Slip	Outfall 12			X	X	X	X		X	X					1		7618908.98	717054.93
091		International Slip	Outfall 13			X	X	X	X		X	X					1		7619190.58	717047.64
092		International Slip	Outfall 17			X	X	X	X		X	X					1		7619878.97	717043.91
093		International Slip	Outfalls 14, 15, 16	N&E	14	X	X	X	X		X	X				1			7619489.17	717042.79
094		International Slip	Outfalls 14, 15, 16			X	X		X		X	X					1		7619574.14	717040.36
096		Schnitzer Steel	Outfall 7			X	X	X	X		X	X					1		7617986.27	716932.81
099		Schnitzer Steel	Outfall 6			X	X	X	X		X	X					1		7618018.06	716712.64
103		Schnitzer Steel	Outfall 5			X	X	X	X		X	X					1		7618198.73	716380.69
105		Owens Corning - Linnton	Downstream of outfall	FS, N&E	20	X	X	X	X	X			X	X		1			7616422.81	716356.41
106		Schnitzer Steel	Outfall 4			X	X	X	X		X	X					1		7618326.36	716108.17
109		Schnitzer Steel	Outfall 3			X	X	X	X		X	X					1		7618393.78	715936.86
111		Schnitzer Steel	Dock with Conveyer	FS, N&E	20	X	X	X	X	X	X	X	X	X		1			7618428.32	715748.88
112		Schnitzer Steel	Outfall 2	FS, N&E	20	X	X	X	X		X	X				1			7618559.41	715598.37
116		Kinder-Morgan	North end of dock, on -30			X	X	X	X	X		X					1		7617048.85	715198.37
121		Kinder-Morgan	Outfall	N&E	14	X	X	X	X	X		X				1			7616984.52	715146.49
122		Kinder-Morgan	Seep-1, Sediment 1	FS, N&E [4]	20	X	X	X	X	X		X				1			7617183.45	714760.88
127		Kinder-Morgan	South end of dock			X	X	X	X	X		X	X	X			1		7617299.71	714222.71
130		City Outfalls	Near Outfall	FS, N&E	20	X	X	X	X	X				X		1			7617465.73	713870.51
133		Linnton Plywood Association	Outfall 6	N&E	14	X	X	X	X	X			X	X		1			7617896.67	713028.68
135		Linnton Plywood Association	Outfall 5, steam cleaning, shop	N&E [4]	14	X	X		X	X						1			7617960.37	712824.52
136		Linnton Plywood Association	Green Wood	FS, N&E [4]	20	X	X	X	X	X						1			7618121.59	712564.30
138		Linnton Plywood Association	Outfalls 3 and 4	N&E	14	X	X		X	X						1			7618107.10	712422.88
139		Linnton Plywood Association	Outfall 2	N&E	14	X	X	X	X	X						1			7618123.34	712279.96
142		Linnton Plywood Association	Columbia Sand and Gravel outfall	FS, N&E	20	X	X	X	X	X						1			7618366.10	712004.68
144		Arco/BP	Transect 5, -40	N&E, CSM	14	X	X			X		X				1			7618800.47	711743.07
145		Arco/BP	Transect 5, middle															1	7618701.48	711706.59
147		Arco/BP	Transect 5, nearshore	FS, N&E	20	X	X	X	X	X		X				1			7618534.57	711624.99
148		Arco/BP	Transect 4, -30	N&E	14	X	X			X		X				1			7618842.64	711483.72
150		Arco/BP	Transect 4, middle	N&E														1	7618740.17	711428.54
151		Arco/BP	Transect 4, nearshore and outfall	N&E	14	X	X			X		X				1			7618650.83	711386.50
152		Arco/BP	Transect 3, -30	N&E	14	X	X			X		X				1			7618935.38	711358.43
153		Arco/BP	Transect 3, middle (new core location)															1	7618818.89	711289.70
155		Arco/BP	Transect 3, nearshore	N&E [4]	14	X	X	X	X	X		X				1			7618733.05	711242.82
156		Arco/BP	Transect 2, -30	N&E	14	X	X			X		X				1			7618980.05	711237.56
157		Arco/BP	Middle transect 2	N&E [4]	14	X	X	X	X	X		X				1			7618870.84	711174.79

Table 2-3. Round 2 Subsurface Sediment Sample Locations and Analyses.

						ANALYTES										SAMPLE PHASING			SAMPLE LOCATION COORDINATES[1]	
Station Number	**Footnote**	**Nearby Facility**	**Location**	**Core Type[2]**	**Core Tube Length (ft)[2]**	**SVOCs**	**Metals**	**Chlorinated Pesticides**	**PCBs**	**TPH**	**Butyltins**	**VOCS**	**Dioxins /Furans**	**Chlorinated Herbicides**	**Hexavalent Chromium**	**Round 2A**	**Round 2B[2]**	**Round 3[2]**	**X**	**Y**
158		Arco/BP	Transect 1, -30	N&E	14	X	X			X		X				1			7619022.09	711161.36
160		Arco/BP	Middle transect 1	FS, N&E [4]	14	X	X	X	X	X		X				1			7618917.22	711105.31
161		Arco/BP	north of dock	N&E [4]	14	X	X	X	X	X		X				1			7618936.55	711018.54
162		Arco/BP	south of dock, -30	N&E	14	X	X			X		X				1			7619152.71	710960.98
163		Arco/BP	south of dock	N&E [4]	14	X	X	X	X	X		X	X	X		1			7619036.86	710917.30
164		City Outfalls	Near Outfall	FS, N&E	20	X	X	X	X	X				X		1			7620735.87	710917.24
166		Mobil Oil Terminal	outfall transect -20/nearshore/			X	X	X	X	X		X					1		7619157.60	710764.59
167		Arco/BP	south end property, outfall	FS, N&E [4]	20	X	X	X	X	X		X				1			7619103.33	710729.29
169		Mobil Oil Terminal	Transect 2, -30	N&E	14	X	X			X		X				1			7619384.29	710606.43
170		Mobil Oil Terminal	Transect 2, nearshore/beach	N&E	14	X	X	X	X	X		X				1			7619279.18	710575.12
171		Mobil Oil Terminal	Transect 3, -30	N&E	14	X	X	X	X	X		X				1			7619460.73	710495.72
172		Mobil Oil Terminal	Transect 3, nearshore/beach	N&E	14	X	X	X	X	X		X				1			7619385.65	710469.92
173		Mobil Oil Terminal	Transect 4, -30	N&E	14	X	X			X		X				1			7619545.28	710317.14
174		Mobil Oil Terminal	Middle transect 4	N&E														1	7619480.74	710283.80
176		Mobil Oil Terminal	Transect 4, nearshore/beach	FS, N&E [4]	20	X	X	X	X	X		X				1			7619487.48	710206.25
177		Mobil Oil Terminal	Transect 5, -30															1	7619721.69	710100.34
179		Mobil Oil Terminal	Transect 5, nearshore/beach	N&E	14	X	X	X	X	X		X				1			7619618.89	710013.35
182		City Outfalls	Near Outfall	N&E	14	X	X	X	X	X				X		1			7619737.50	709931.64
184		Mobil Oil Terminal	Transect 6, nearshore outfall	FS, N&E	20	X	X	X	X	X		X				1			7619835.20	709792.26
185		Mobil Oil Terminal	Transect 6, -20	N&E	14	X	X			X		X	X	X		1			7619943.11	709765.58
187		Mobil Oil Terminal	south end of property			X	X	X	X	X		X					1		7620093.82	709481.77
192		MarCom Shipyard	Downstream end of dry dock	N&E	14	X	X	X	X	X	X	X	X	X		1			7621671.56	709091.44
196		MarCom Shipyard	Adjacent to drydock	N&E	14	X	X			X	X	X				1			7621748.52	708910.53
197		City Outfalls	Near Outfall at MarCom	FS, N&E	20	X	X	X	X	X				X		1			7621965.12	708898.34
199		MarCom Shipyard	Transect 2, nearshore	FS, N&E	20	X	X	X	X	X	X	X				1			7622227.58	708758.65
201		MarCom Shipyard	middle Transect 1	N&E	14	X	X	X	X	X	X	X				1			7622139.85	708741.15
202		MarCom Shipyard	Transect 2, -20	N&E	14	X	X	X	X	X	X	X				1			7622047.92	708725.39
206		MarCom Shipyard	Barge wreck -20	N&E	14	X	X	X	X	X	X	X				1			7622089.39	708597.43
207		MarCom Shipyard	outfall at south property line	N&E [4]	14	X	X	X	X	X	X	X	X	X		1			7622239.38	708584.77
210		Brix Maritime	outside slip middle	N&E	14	X	X	X	X	X	X	X	X	X		1			7620899.01	708506.83
213		Brix Maritime	South outfall	FS, N&E	20	X	X	X	X		X	X				1			7621006.27	708375.70
215		MarCom Shipyard	outfall -30	N&E	14	X	X			X	X	X				1			7622425.47	708260.18
219		rm5-6 oily extents	downstream east of oily extent															1	7621519.48	708159.30
220		rm5-6 oily extents	downstream west of oily extent	N&E	14	X	X	X	X	X						1			7621466.02	708116.35
221		rm5-6 oily extents	on oily extent	N&E, CSM	14	X	X	X	X	X						1			7621535.53	708094.14
223		rm5-6 oily extents	upstream of oily extent															1	7621579.22	708042.23
227		Marine Finance	Seeps north end of property			X	X	X	X	X	X						1		7621406.12	707768.57
228		Marine Finance	Houseboat construction	FS, N&E	20	X	X	X	X	X	X					1			7621484.79	707768.55
231		Marine Finance	north of dock	FS, N&E	20	X	X	X	X	X	X					1			7621716.27	707548.55
232		City Outfalls	Near Outfall	FS, N&E	20	X	X	X	X	X				X		1			7623199.83	707520.21
240		Marine Finance	south of St. Johns bridge	N&E	14	X	X	X	X	X	X					1			7622005.37	707181.74
244		Crawford Street	Nearshore, downstream end of be	N&E	14	X	X	X	X							1			7623942.71	707010.83
245		Marine Finance	south of tow boat dock	FS, N&E	20	X	X	X	X	X	X		X	X		1			7622154.58	706985.90
247		Crawford Street	Nearshore downstream of outfall	N&E	20	X	X	X	X	X			X	X		1			7624112.28	706913.01
252		Gasco	Transect 2, -40	N&E [4]	14	X	X	X	X	X						1			7623379.32	706491.50
254		Willamette Cove	Nearshore of 244	N&E [4]	14	X	X	X	X							1			7624863.85	706427.88
255		Willamette Cove	Most northwest	N&E, CSM	14	X	X	X	X							1			7624574.12	706391.48
256		Gasco	Transect 1, -40															1	7623611.45	706322.63
257		Willamette Cove	north of outfall	N&E [4]	14	X	X	X	X							1			7625162.02	706278.38
258		Gasco	Transect 5, -40	N&E [4]	14	X	X	X	X	X						1			7623837.60	706202.90
260		Willamette Cove	west of outfall -30	N&E [4]	14	X	X	X	X	X			X	X		1			7625323.31	706172.62
262		Willamette Cove	outfall -30															1	7625037.48	706135.27
263		Gasco	Transect 2, nearshore	N&E [4]	14	X	X	X	X	X		X				1			7623141.17	706106.52
264		Gasco	Transect 1, toe of slope	N&E [4]	14	X	X	X	X	X		X				1			7623449.43	706060.93
265		Gasco	Transect 7, -40															1	7624083.10	706034.68
266		Willamette Cove	south of outfall	N&E	14	X	X	X	X							1			7625489.93	705971.73
267		Willamette Cove	east of outfall	N&E [4]	14	X	X	X	X							1			7626016.90	705963.15
268		Willamette Cove	Another outfall	N&E	14	X	X	X	X							1			7625761.05	705961.32
269	3	Gasco	transect 1, nearshore	FS, N&E [4]	20	X	X	X	X	X		X				1			7623373.30	705958.37
270		Gasco	Transect 5, toe of slope	N&E [4]	14	X	X	X	X	X		X				1			7623675.62	705923.38
272		Gasco	Transect 8, -40	N&E [4]	14	X	X	X	X	X						1			7624311.58	705889.14
273	3	Gasco	Transect 5, -5	N&E [4]	14	X	X	X	X	X		X				1			7623638.52	705878.74
274		Gasco	Transect 5, nearshore															1	7623628.80	705819.65
275		Willamette Cove	south of outfall, -30															1	7625942.38	705791.84

Table 2-3. Round 2 Subsurface Sediment Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	Core Type[2]	Core Tube Length (ft)[2]	ANALYTES: SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	SAMPLE PHASING: Round 2A	Round 2B[2]	Round 3[2]	SAMPLE LOCATION COORDINATES[1]: X	Y
276		Gasco	Transect 7, toe of slope	N&E [4]	14	X	X	X	X	X		X				1			7623952.11	705778.73
277		Willamette Cove	north side of WC, -20	N&E	14	X	X	X	X	X	X					1			7626684.11	705771.50
278		Gasco	Transect 6, -30	N&E [4]	14	X	X	X	X	X		X				1			7623909.32	705765.36
280		Willamette Cove	next to outfall -20	N&E	14	X	X	X	X		X					1			7627021.38	705722.71
281		Wacker	Transect 11, -40															1	7624667.23	705721.24
282		Willamette Cove	nearshore, next to outfall	FS, N&E [4]	20	X	X	X	X							1			7627336.61	705701.34
283		Gasco	Transect 7, nearshore	FS, N&E [4]	20	X	X	X	X	X		X				1			7623867.87	705694.56
284		Gasco	Transect 8, toe of slope	N&E [4]	14	X	X	X	X	X		X				1			7624189.70	705664.12
287		Wacker	Transect 12, -40															1	7624843.38	705641.80
288	3	Gasco	Transect 8, -5	N&E [4]	14	X	X	X	X	X		X				1			7624145.51	705585.72
289		Gasco	Transect 10, toe of slope	N&E [4]	14	X	X			X		X				1			7624363.69	705561.24
290		Willamette Cove	mouth of WC -40	N&E	14	X	X				X					1			7626171.84	705525.02
291		Willamette Cove	center of WC	N&E, CSM	14	X	X			X	X					1			7626796.97	705519.68
292		Gasco	Transect 8, nearshore															1	7624109.70	705514.52
293		Willamette Cove	mouth of WC -30	N&E	14	X	X	X	X	X	X					1			7626525.66	705497.48
294		Gasco	Transect 10, -5	N&E [4]	14	X	X	X	X	X		X				1			7624334.13	705494.24
295		Willamette Cove	center of WC, -20	N&E [4]	14	X	X	X	X							1			7627095.76	705483.75
297		Wacker	Transect 11, toe of slope	N&E [4]	14	X	X			X		X				1			7624513.94	705462.01
298		Gasco	Transect 10, nearshore															1	7624297.87	705428.62
299		Wacker	Transect 12, toe of slope	N&E [4]	14	X	X			X		X				1			7624673.41	705378.80
300		Wacker	Transect 14, -40	N&E [4]	14	X	X			X		X				1			7625363.17	705374.13
301	3	Wacker	Transect 11, nearshore	FS, N&E [4]	20	X	X	X	X	X		X				1			7624457.95	705330.34
302		Wacker	Transect 12, -5	N&E [4]	14	X	X	X	X	X		X				1			7624632.88	705316.37
304		Wacker	Transect 12, nearshore															1	7624598.35	705257.66
305		Wacker	Transect 13, toe of slope	N&E [4]	14	X	X	X	X	X		X				1			7624923.20	705224.98
307		Wacker	Transect 15, -40															1	7625788.93	705197.12
309		Wacker	Transect 14, toe of slope															1	7625170.00	705071.17
311		Wacker	Transect 14, -5			X	X	X	X	X		X					1		7625137.14	705014.16
312		Wacker	Transect 14, nearshore	FS, N&E [4]	20	X	X	X	X	X		X				1			7625097.42	704952.00
313		Wacker	Transect 16, -40	N&E [4]	14	X	X	X	X	X		X	X	X		1			7626344.56	704902.30
314		Wacker	Transect 15, toe of slope	N&E [4]	14	X	X	X	X	X		X	X	X		1			7625557.25	704832.87
315		Wacker	Transect 15, -5			X	X	X	X	X		X	X	X			1		7625536.36	704790.38
316		Wacker	Transect 15, nearshore	N&E [4]	14	X	X	X	X	X		X	X	X		1			7625502.35	704711.00
317		Wacker	Transect 16, -35															1	7626194.20	704669.65
321		Wacker	Transect 16, -5			X	X	X	X	X		X	X	X			1		7626065.54	704446.42
323		Wacker	Transect 16, nearshore	N&E [4]	14	X	X	X	X	X		X	X	X		1			7626012.62	704367.04
324		Rhone Poulenc	Farthest north	N&E	14	X	X	X	X			X	X	X		1			7626164.06	704325.30
325		Rhone Poulenc	Farther in river from 239															1	7626363.07	704274.08
326		Rhone Poulenc	Transect 1, -30	N&E	14	X	X	X	X			X	X	X		1			7626466.07	704265.12
327		Rhone Poulenc	Southeast boundary of Wacker	N&E	14	X	X	X	X			X	X	X		1			7626235.83	704228.00
329		Rhone Poulenc	Transect 1, -20	N&E [4]	14	X	X	X	X			X	X	X		1			7626362.74	704163.96
330		Rhone Poulenc	Farther in river from 241															1	7626522.05	704074.79
331		Rhone Poulenc	transect 1, nearshore	FS	20	X	X	X	X			X	X	X		1			7626289.52	704072.39
332		Rhone Poulenc	Transect 2, -30	N&E [4]	14	X	X	X	X			X	X	X		1			7626627.30	704059.11
333		Rhone Poulenc	South of bridge, nearshore	N&E [4]	14	X	X	X	X			X	X	X		1			7626419.05	703994.18
334		Rhone Poulenc	Transect 2, -20	N&E [4]	14	X	X	X	X			X	X	X		1			7626524.29	703956.11
335		Rhone Poulenc	Transect 2, nearshore	N&E [4]	14	X	X	X	X			X	X	X		1			7626463.83	703888.93
337		Atofina	Transect 1, channel															1	7627852.45	703611.70
341		Atofina	Middle transect 1	N&E	14	X	X	X							X	1			7627555.20	703333.66
342		Triangle Park	downstream edge of cove	N&E, CSM	14	X	X	X	X	X	X					1			7629483.81	703269.06
343		Atofina	Transect 2, across river from s															1	7628722.31	703259.48
346		Triangle Park	outfall in cove	N&E	14	X	X	X	X	X	X					1			7629672.74	703123.73
347		Triangle Park	high concs in cove	N&E [4]	14	X	X	X	X	X	X					1			7629827.76	703080.13
348		Atofina	transect 1, nearshore	N&E, FS	20	X	X	X	X			X			X	1			7627254.76	703067.37
349		Atofina	Transect 2, channel	N&E	14	X	X	X							X	1			7628391.44	702933.96
351		Atofina	Northern dock	N&E	20	X	X	X	X	X			X	X	X	1			7627729.71	702757.85
352	3	Triangle Park	upstream outfall	N&E [4]	14	X	X	X	X	X	X					1			7629918.88	702618.49
356		Atofina	Middle dock	N&E	20	X	X	X				X			X	1			7628145.96	702304.24
357		Atofina	Transect 3- Channel	N&E	14	X	X	X							X	1			7629145.30	702293.58
359		Atofina	North metal transect -20	N&E	14	X	X	X	X			X			X	1			7628284.71	702149.48
360		Atofina	North metal transect, nearshore			X	X	X	X			X			X		1		7628220.67	702096.12
361		Atofina	Transect 3- Channel	N&E	14	X	X	X							X	1			7628852.88	702007.25
362		Atofina	South metal transect, -20	N&E	14	X	X	X	X						X	1			7628429.68	701983.17
364		Portland Shipyard	Coast Guard	N&E	14	X	X	X	X		X					1			7633229.91	701940.78

Table 2-3. Round 2 Subsurface Sediment Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	Core Type[2]	Core Tube Length (ft)[2]	ANALYTES										SAMPLE PHASING			SAMPLE LOCATION COORDINATES[1]	
						SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Round 2A	Round 2B[2]	Round 3[2]	X	Y
366		Atofina	South metal transect, nearshore	FS, N&E	20	X	X	X	X						X	1			7628354.96	701925.35
368		Atofina	Southern dock	N&E	14	X	X	X	X						X	1			7628524.86	701807.94
371		Atofina	inside southern dock	FS	20	X	X	X	X	X					X	1			7628511.74	701694.13
372		Portland Shipyard	downstream of shipyard	N&E	14	X	X	X	X	X	X		X	X		1			7632672.95	701608.49
373		Portland Shipyard	downstream of shipyard	N&E	14	X	X		X		X					1			7630470.58	701579.51
375		Portland Shipyard	downstream of shipyard															1	7631320.62	701318.70
377		Willbridge	NW corner Willbridge cove	FS, N&E	20	X	X	X	X	X			X	X		1			7628450.13	701158.83
379		Portland Shipyard	Swan Island Lagoon Center Trans	N&E	14	X	X	X	X	X	X		X	X		1			7633965.55	701096.63
380		Portland Shipyard	SI Lagoon mainland shoreline	FS, N&E	20	X	X	X	X		X					1			7634417.32	701090.22
381		Willbridge	Off Chevron Pier			X	X	X	X	X		X					1		7629322.85	701083.36
382		Portland Shipyard	Swan Island Lagoon PSY shoreline	N&E	14	X	X	X	X	X	X					1			7633573.68	701040.80
383		City Outfalls	Near Outfall	N&E	14	X	X	X	X	X				X		1			7634657.57	700871.91
384		Portland Shipyard	PSY-downstream	N&E	14	X	X	X	X	X	X					1			7632708.52	700799.45
386		Portland Shipyard	downstream of west end of dry dock 4	N&E	14	X	X	X	X		X					1			7631219.69	700771.78
388		Portland Shipyard	SI Lagoon mainland shoreline	N&E	14	X	X		X		X					1			7634811.69	700724.58
392		Portland Shipyard	PSY-downstream	N&E	14	X	X	X	X	X	X					1			7632324.14	700479.13
393		Portland Shipyard	Swan Island Lagoon PSY shoreline	N&E	14	X	X	X	X		X					1			7634313.37	700447.50
396		Portland Shipyard	SI Lagoon mainland shoreline	N&E	14	X	X	X	X		X					1			7635243.16	700348.30
397		Portland Shipyard	Swan Island Lagoon Center Trans	N&E, CSM	14	X	X	X	X	X	X		X	X		1			7634969.44	700280.30
400		Portland Shipyard	PSY-downstream	N&E, CSM	14	X	X		X		X					1			7631382.20	700172.84
401		City Outfalls	Near Outfall	FS, N&E [4]	20	X	X	X	X	X				X		1			7629028.45	700149.31
402		Portland Shipyard	Swan Island Lagoon PSY shoreline	N&E	14	X	X		X	X	X					1			7634696.03	700125.68
403		Willbridge	McCall Pier	FS, N&E [4]	20	X	X	X	X	X		X	X	X		1			7629828.17	700119.21
405		City Outfalls	Near Outfall	N&E	14	X	X	X	X	X				X		1			7635944.86	699903.72
409		Portland Shipyard	off ballast water outfall, at or near G51	N&E	14	X	X	X	X							1			7632511.05	699783.31
413		Front Avenue LLP	near Front Avenue outfall	N&E	14	X	X	X	X							1			7630350.38	699530.31
415		Portland Shipyard	Swan Island Lagoon PSY shoreline	FS, N&E	20	X	X	X	X		X					1			7635472.34	699486.08
417		Portland Shipyard	SI Lagoon mainland shoreline	N&E	14	X	X	X	X		X					1			7636481.04	699412.75
420		City Outfalls	Near Outfall	N&E, CSM	14	X	X	X	X	X			X	X		1			7633292.41	699197.27
421		Portland Shipyard	Swan Island Lagoon PSY shoreline	N&E	14	X	X		X		X					1			7635853.36	699175.27
425		City Outfalls	Near Outfall	N&E	14	X	X	X	X	X				X		1			7636991.51	698955.36
426		Portland Shipyard	Swan Island Lagoon PSY shoreline	N&E	14	X	X	X	X	X	X		X	X		1			7636226.71	698838.42
430		City Outfalls	Near Outfall	FS, N&E	20	X	X	X	X	X				X		1			7636719.71	698383.66
431		Shaver Transportation	near shoreline seep / outfall	N&E	20	X	X	X	X		X					1			7631233.38	698272.89
432		City Outfalls	Near Outfall at Shaver Transportation											X				1	7631229.69	698196.14
434		Shaver Transportation	inside dock	FS, N&E	20	X	X	X	X		X					1			7631310.35	698070.67
436		Lakeside Industries	at end of northern dock	N&E	14	X	X		X		X					1			7631912.70	697829.83
437		Lakeside Industries	In front of Lakeside Industries	FS, N&E	20	X	X	X	X	X	X		X	X		1			7631465.84	697829.51
439		Lakeside Industries	Off of private outfall	N&E	14	X	X	X	X		X	X				1			7631591.54	697644.83
440		Gunderson	ds of southern dock	N&E [4]	14	X	X		X		X					1			7632318.69	697561.87
441		Gunderson	Adjacent to southern dock	N&E [4]	14	X	X	X	X		X	X				1			7632095.55	697528.56
444		Gunderson	off Gunderson	N&E [4]	14	X	X	X	X		X	X				1			7632432.37	697249.26
445		Gunderson	off Gunderson	FS, N&E	20	X	X	X	X	X	X	X				1			7632168.48	697241.14
447		Gunderson	off Gunderson	N&E [4]	14	X	X		X	X	X					1			7632627.24	697103.11
448		Shell/ Texaco	At dock	N&E	14	X	X		X	X	X					1			7633101.24	697061.28
449		Gunderson	Gunderson box			X	X		X		X						1		7633644.35	696966.68
450		Shell/ Texaco	At dock	N&E	14	X	X	X	X	X	X		X	X		1			7633355.78	696917.37
452		Gunderson	Gunderson box															1	7634062.45	696768.46
453		Gunderson	Gunderson box	N&E [4]	14	X	X	X	X	X	X					1			7633506.35	696754.86
454		City Outfalls	Near Outfall, RM 9.3 east	FS, N&E	20	X	X	X	X	X			X	X		1			7636605.75	696736.29
455		City Outfalls	Near Outfall, RM 8.8 west -Texaco	FS, N&E	20	X	X	X	X	X				X		1			7633294.33	696673.56
456		Gunderson	Gunderson box	FS, N&E	20	X	X	X	X		X					1			7633718.16	696652.16
457		Gunderson	Gunderson box	N&E	14	X	X	X	X		X					1			7633934.18	696548.30
458		Gunderson	Gunderson box	N&E	14	X	X	X	X		X					1			7634218.48	696530.11
460		Gunderson	Gunderson box															1	7634502.77	696511.92
461		Gunderson	Gunderson box	N&E	14	X	X	X	X		X					1			7634374.50	696291.76
462		Gunderson	Gunderson box	N&E	14	X	X		X		X					1			7634658.79	696273.56
464		Gunderson	Gunderson box															1	7634943.08	696255.37
468		Gunderson	Gunderson box	N&E	14	X	X	X	X		X					1			7634814.81	696035.21
469		Gunderson	Gunderson box															1	7635099.10	696017.02
471		Gunderson	Gunderson box	N&E, CSM	14	X	X		X		X					1			7635383.40	695998.82
474		Gunderson	Gunderson box	N&E	14	X	X	X	X	X	X		X	X		1			7635224.75	695869.78
477		Gunderson	Gunderson box	FS	20	X	X	X	X	X	X					1			7635226.62	695707.82
480		James River Corporation	upstream of Gunderson															1	7635355.69	695624.30

Table 2-3. Round 2 Subsurface Sediment Sample Locations and Analyses.

Station Number	Footnote	Nearby Facility	Location	Core Type[2]	Core Tube Length (ft)[2]	ANALYTES										SAMPLE PHASING			SAMPLE LOCATION COORDINATES[1]	
						SVOCs	Metals	Chlorinated Pesticides	PCBs	TPH	Butyltins	VOCS	Dioxins /Furans	Chlorinated Herbicides	Hexavalent Chromium	Round 2A	Round 2B[2]	Round 3[2]	X	Y
492		Terminal 2	mouth of Slip off outfall	N&E		X	X		X								1		7637616.65	694315.76
494		Fire Dock Slip near Terminal 2	off of City Outfall	N&E	14	X	X	X	X							1			7637229.56	694147.29
			No. of Round 2A 14' Cores		**143**															
			No. of Round 2A 20' Cores		**54**															
258		**TOTAL NUMBER CORE STATIONS**		**258**										**TOTAL CORES PER ROUND**		**197**	**30**	**31**		

Notes:

[1] - Oregon State Plane North. International Feet, NAD 83

[2] - Core type, tube length, and analyte information for Round 2B and Round 3 stations will be provided in the Round 2B and Round 3 FSP addenda.

[3] - This station has been selected for archaeological monitoring.

[4] - The data from this location will also be used, as applicable, for assessment of potential groundwater impacts.

Table 2-4. Coring Approach Summary.

Category	Purpose	Locations	Rationale	Proposed Core Tube Length/ Rationale	Subsampling Approach	Estimated No. Core Segment Samples Analyzed per Location	Analyses
Nature and Extent	Nature and extent of contaminant releases	Potential current or historical surface/near-surface sources of contamination (e.g., outfalls, over-water activities)	Provides site-wide information of the nature and extent of sediment quality	14 feet (138 stations); 20 feet (4 stations) /Identification of problem areas	Lithologic description of core and sampling. Vertical composites of the two uppermost subsurface lithologic units (between 1-4 feet thick) determined by visual observation (or a deeper interval determined by field screening techniques), as well as any analytes in the bottom-most interval with short holding times, will be submitted for analysis. All other intervals will be composited and archived	2 [1] ; two subsurface units (surface foot sampled by grab)	SVOCs, total metals, pesticides and PCBs, grain size, total organic carbons; with VOCs, TBT, chorinated herbicides, dioxins/furans, hexavalent chromium, TPH added at selected locations.
Feasibility Study	Determine depth of contamination where historical contamination may be present at depth	Potential current or historical subsurface contamination (e.g., historical outfalls, over-water activities, contaminated groundwater discharge)	Provides general site characterization as well as information that may be used in the FS	20 feet (52 stations) / Identify contamination at depth	Lithologic description of core and sampling. Vertical composites of up to four subsurface lithologic units (between 1-4 feet thick) determined by visual observation, to a depth of 8 feet below the mudline. All subsurface intervals below the uppermost two will be composited in intervals at least 2 feet thick. Intervals below 8 feet will be archived. Analytes in the bottom-most interval with short holding times will be submitted for analysis.	2 to 4[1]; up to four 2- to 4-foot subsurface intervals to 8 feet below mudline (surface foot sampled by grab)	Same as N & E cores
Groundwater	Determine if contaminated sediments are present where contaminated groundwater has the potential to intersect the river	Known or potential contaminated groundwater discharge areas to be determined as part of the CSM update	Provides information on where groundwater is a source of contamination to river sediments	Specific target groundwater core lengths and locations will be identified in the Round 2B FSP	To be specified in the Round 2B FSP	To be specified in the Round 2B FSP	To be specified in the Round 2B FSP
Physical CSM	Validate the CSM	Various channel and nearshore transport regimes and zones. Specific locations to be provided in an addendum to this FSP.	Cores distributed throughout site in various transport/depositional environments	14 feet / Assess sediment texture in sediment column likely to be disturbed in record scour events (excluding dredged areas, natural deepening greater than 10' over T1T3 accounted for <0.01% of channel area and 0.39% of nearshore areas)	Stratigraphic sampling. Vertical composites of each subsurface stratigraphic unit (at least 1 foot thick) determined by visual observation will be analyzed.	3 to 5	Grain-size distribution and specific gravity

1 - Up to four subsurface core segments may be analyzed per 20-foot core tube sample. In addition to the estimated number shown, bottom intervals in cores requiring VOC, TPH-G, and/or hexavalent chromium analysis will be submitted initially.

Table 4-1. Sample Containers, Preservation, Holding Times, and Sample Volume.

Container[1] Type	Size	Laboratory	Analysis	Preservation	Holding Time	Sample Size[2]
Sediment samples						
G/P	8 oz	CAS	Grain size (sediment)	4±2ºC	6 months	100 g
G/P	8 oz	CAS	Atterberg limits and specific gravity	4±2ºC	6 months	225 g
WMG	2 oz	CAS	Total sulfides	No headspace; 4±2ºC (do not freeze)	7 days	5 g
WMG	16 oz [3]	CAS	Ammonia	4±2ºC	7 days	40 g
			Total organic carbon		28 days[4]	1 g
			Mercury		28 days[5]	5 g
			Metals and total solids		6 months[4]	10 g
			Hexavalent chromium		1 month/7days[6]	5 g
			Butyltins		14 days[4]	20 g
			TPH - diesel- and oil-range		14 days[4]	20 g
WMG	2 oz	CAS	TPH - gasoline range	No headspace; 4±2ºC (do not freeze)	14 days	5 g
WMG	2 oz	CAS	VOCs	No headspace; 4±2ºC (do not freeze)	14 days	5 g
WMG	16 oz	NEA	SVOCs	Deep Frozen (-20ºC)	1 year	30 - 60 g
			Pesticides		1 year	30 g
			PCBs		1 year	30 g
WMG	8 oz	STL	Herbicides	Deep Frozen (-20ºC)	1 year	50 - 80 g
WMG	8 oz	CAS	PCDD/PCDFs	Deep Frozen (-20ºC)	1 year	50 g
			PCB congeners		1 year	10 g
HDPE	64 oz	NAS	Bioassay (per test)	4±2ºC in the dark	14 days	750-1000 g
WMG	2 - 8 oz	CAS	Archival	Deep Frozen (-20ºC)	1 year	not applicable
Equipment Rinse Blanks						
HDPE	500 mL	CAS	Metals and Mercury	5 ml of 1:1& HNO_3 & 4±2ºC	6 months/60 days[7]	100 ml
Poly-carbonate	500 mL	CAS	Butyltins	Dark; 4±2ºC	7 days	500 mL
VOA vial	2 oz/ septum	CAS	TPH - gasoline	No headspace; HCl to pH 2; 4±2ºC	14 days	5 mL
AG	500 mL	CAS	TPH - diesel and oil	HCl to pH 2; 4±2ºC	14 days	500 mL
VOA vial	2 oz/ septum	CAS	VOCs	No headspace; HCl to pH 2; 4±2ºC	14 days	5 mL
AG	500 mL	NEA	SVOCs	Dark; 4±2ºC	7 days/40 days[8]	500 mL
AG	500 mL	NEA	Pesticides	Dark; 4±2ºC	7 days/40 days[8]	500 mL
AG	500 mL	NEA	PCBs	Dark; 4±2ºC	7 days/40 days[8]	500 mL
AG	500 mL	STL	Herbicides	Dark; 4±2ºC	7 days/40 days[8]	500 mL
AG	500 mL	CAS	Dioxins/Furans	Dark; 4±2ºC/-10ºC[8]	1 year/1 year[8]	500 mL
AG	500 mL	CAS	PCB congeners	Sulfuric acid to pH 2-3; 4±2ºC/-10ºC[8]	1 year/1 year[9]	500 mL

WMG = Wide Mouth Glass
HDPE = High Density Polyethylene
AG = Amber Glass
G/P = Glass or Plastic

[1]Size and number of containers may be modified by analytical laboratory.
[2]All samples will need a minimum of 5% QA. Collection of 3x normal sample size listed will be necessary.
[3]An additional 8 oz to 16 oz jar needed for lab QC for 5% of samples.
[4]Holding times for frozen samples are as follows: Total organic carbon, 1 year; metals (except mercury), 2 years; butyltin species, 6 months; diesel- and oil-range TPH, 1 year.
[5]The holding time for mercury in frozen (i.e, archived) samples is 180 days, as approved by EPA (Humphrey 2002).
[6]Holding time is 1 month to extraction and extracts must be analyzed within 7 days from extraction.
[7]Based on EPA Method 1631 Revision D.
[8]Holding time is 7 days to extraction and extracts must be analyzed within 40 days from extraction.
[9]Conditions for equipment blanks/conditions for extracts.

Table 4-2. Field QC Sample Collection Summary for Sediment Samples.

Sample Type	Frequency
Temperature Blanks	1 per cooler
Blind Field Splits (sediment only)	5 percent[1]
Blind Field Replicates[2]	5 percent
Field Equipment Rinsate Blanks	5 percent
Field Trip Blanks (VOC analysis only)	1 per cooler

[1] 2.5 percent blind field splits and 2.5 percent blind field splits for EPA from the same locations.
[2] Duplicates will be collected for sediment.

Table 4-3. Summary of Estimated Numbers of Round 2 Field QC Samples[1].

Sample Type	Samples	Blind Field Sample Splits[1]	Blind Field Replicates	Field Rinsate Blanks	Total Number of Field Samples
Sediment - Surface					
SVOCs	517	13	26	26	582
Metals	517	13	26	26	582
Pesticides	461	12	23	23	519
PCBs	476	12	24	24	536
Total Petroleum Hydrocarbons	205	5	10	10	166
Butyltins	108	3	5	5	122
Volatile Organic Compounds	145	4	7	7	163
Dioxins/Furans	51	1	3	3	30
Chlorinated Herbicides	58	1	3	3	65
Hexavalent Chromium	14	1	1	1	17
Sediment - Subsurface Round 2A					
SVOCs	496	12	25	25	558
Metals	496	12	25	25	558
Pesticides	421	11	21	21	474
PCBs	448	11	22	22	455
Total Petroleum Hydrocarbons	330	8	17	17	271
Butyltins	162	4	8	8	182
Volatile Organic Compounds	296	7	6	6	315
Dioxins/Furans	74	2	4	4	83
Chlorinated Herbicides	66	2	3	3	74
Hexavalent Chromium	41	1	2	2	19
Sediment - Subsurface Round 2B					
SVOCs	86	2	4	4	77
Metals	86	2	4	4	77
Pesticides	86	2	4	4	97
PCBs	89	2	4	4	73
Total Petroleum Hydrocarbons	33	1	2	2	37
Butyltins	60	2	3	3	54
Volatile Organic Compounds	108	3	3	3	117
Dioxins/Furans	6	0	1	1	8
Chlorinated Herbicides	6	0	1	1	8
Hexavalent Chromium	4	0	1	1	6

[1]All samples will be analyzed for total solids, grain size, total organic carbon, and specific gravity. In addition, sediment samples collected for toxicity testing will be analyzed for ammonia and total sulfides. Finally, 10% of all sediment samples will be analyzed for Atterberg limits. Replicates and split samples will be analyzed for conventionals and chemicals of concern. Conventionals are excluded from the analysis of rinsate blanks. Field QC sample numbers based on a frequency of 5% for field replicates and 2.5% for field splits. EPA will also receive field splits at a frequency of 2.5%; these EPA splits are not tallied in this table.

Table 5-1. Round 2 Sediment Analytes[1].

Analyte
Conventional Analyses
Total solids
Grain size
Total sulfides
Ammonia
Total organic carbon
Geotechnical characteristics
Specific gravity
Atterberg limits
Metals
Antimony
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Selenium
Silver
Zinc
Hexavalent chromium
Butyltins
Monobutyltin
Dibutyltin
Tributyltin
Tetrabutyltin
PCB Aroclors
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Aroclor 1262
Aroclor 1268
Chlorinated Herbicides
Dalapon
Dicamba
MCPA
Dichlorprop
2,4-D
2,4,5-TP (Silvex)
2,4,5-T
2,4-DB
Dinoseb
MCPP
Organochlorine Pesticides
2,4'-DDD
2,4'-DDE

Table 5-1. Round 2 Sediment Analytes[1].

Analyte
2,4'-DDT
4,4'-DDD
4,4'-DDE
4,4'-DDT
Total DDT
Aldrin
a - BHC
b - BHC
d - BHC
g - BHC (Lindane)
a - Chlordane
g - Chlordane
Oxychlordane
cis - Nonachlor
trans - Nonachlor
Total Chlordane[2]
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
Heptachlor
Heptachlor epoxide
Methoxychlor
Mirex
Toxaphene
Volatile Organic Compounds
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2,3-Trichloropropane
1,2-Dichloroethane
1,2-Dichloropropane
2-Butanone
2-Chloroethyl Vinyl Ether
2-Hexanone
4-Methyl-2-Pentanone
Acetone
Acrolein
Acrylonitrile
Benzene
Bromochloromethane
Bromodichloromethane
Bromoethane
Bromoform

Table 5-1. Round 2 Sediment Analytes[1].

Analyte
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
cis - 1,3-Dichloropropene
Dibromomethane
Dichlorodifluoromethane
Ethyl benzene
Iodomethane
Isopropyl Benzene
m,p -Xylene
Methylene Chloride
Methyl-t-butyl ether (MTBE)
Naphthalene
o -Xylene
Styrene
Tetrachloroethene
Toluene
trans - 1,2-Dichloroethene
trans - 1,3-Dichloropropene
trans - 1,4-Dichloro-2-Butene
Trichloroethene
Trichlorofluoromethane
Vinyl Acetate
Vinyl Chloride
Petroleum Hydrocarbons (TPH)
Petroleum hydrocarbons - diesel and oil range
Petroleum hydrocarbons - gasoline
Semivolatile Organic Compounds
Halogenated Compounds
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,2,4-Trichlorobenzene
Hexachlorobenzene
2-Chloronaphthalene
Hexachloroethane
Hexachlorobutadiene
Hexachlorocyclopentadiene
2,2'-oxybis(1-chloropropane)
Bis-(2-chloroethoxy) methane
Bis-(2-chloroethyl) ether
4-Chlorophenyl-phenyl ether
4-Bromophenyl-phenyl ether
3,3’-Dichlorbenzidine
4-Chloroaniline

Table 5-1. Round 2 Sediment Analytes[1].

Analyte
Organonitrogen Compounds
Nitrobenzene
Aniline
2-Nitroaniline
3-Nitroaniline
4-Nitroaniline
n-Nitrosodimethylamine
n-Nitroso-di-n-propylamine
n-Nitrosodiphenylamine
1,2-Diphenylhydrazine
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Carbazole
Oxygen-Containing Compounds
Benzoic acid
Benzyl alcohol
Dibenzofuran
Isophorone
Phenols and Substituted Phenols
Phenol
2-Methylphenol
4-Methylphenol
2,4-Dimethylphenol
2-Chlorophenol
2,4-Dichlorophenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,3,4,6-Tetrachlorophenol
2,3,4,5- and 2,3,5,6-Tetrachlorophenol
Pentachlorophenol
4-Chloro-3-methylphenol
2-Nitrophenol
4-Nitrophenol
2,4-Dinitrophenol
4,6-Dinitro-2-methylphenol
Phthalate Esters
Dimethylphthalate
Diethylphthlalate
Di-n-butylphthalate
Butylbenzylphthalate
Di-n-octylphthalate
bis(2-Ethylhexyl)phthalate
Polycyclic Aromatic Hydrocarbons
Naphthalene
2-Methylnaphthalene
Acenaphthylene
Acenaphthene
Fluorene
Phenanthrene
Anthracene
Fluoranthene

Table 5-1. Round 2 Sediment Analytes[1].

Analyte
Pyrene
Benzo(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Chlorinated Dioxins and Furans
2,3,7,8-TCDD
2,3,7,8-TCDF
1,2,3,7,8-PeCDD
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,4,6,7,8-HpCDD
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDD
OCDF
Total tetrachlorinated dioxins
Total pentachlorinated dioxins
Total hexachlorinated dioxins
Total heptachlorinated dioxins
Total tetrachlorinated furans
Total pentachlorinated furans
Total hexachlorinated furans
Total heptachlorinated furans

[1]Additional information is provided in the Round 2 QAPP.

[2]Total chlordane will be calculated as the sum of the 5 components listed above this entry.